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REVISION OF THE HAWAIIAN SPECIES OF EUPHORBIA L.[1]

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INTRODUCTION

The vast size of the genus *Euphorbia* has perhaps deterred students of the Hawaiian flora hitherto from attempting a revision of its Hawaiian species. The conflicting views regarding the integrity or unity of *Euphorbia* as a genus in the broad sense employed, for example, by Boissier *(in* DeCandolle, Prodromus **15**, pt. 2. 1862), have doubtless contributed in no small measure toward the same result. In studying the literature on *Euphorbia* and the numerous proposed segregates, I have been impressed with the interrelation of these two factors. *Euphorbia* (using the name always in its broader or Boissieran sense), by the very reason of its vastness, affords such internal diversification as to suggest various generic segregations, at the same time displaying so many intergradations among the suggested segregates as to make questionable the wisdom of their establishment.

Realizing that generic as well as other taxonomic concepts are to a great extent necessarily subjective, I have consulted not only all available specimens but also the opinions, both oral and published, of many taxonomists who have given *Euphorbia*

[1] Issued December 27, 1937.

particular attention. In a general way it has seemed that the more cosmopolitan one's studies in the genus have been, the less disposed or able he has felt to resolve *Euphorbia* into an assemblage of distinct genera. Accordingly, it would appear that in the present state of our knowledge the ends of prudence and conservatism are best respected by retaining as sections of *Euphorbia* a number of subgroups segregated by some writers as genera (e. g., *Anisophyllum, Poinsettia, Tithymalus).* In this connection, however, we may note the position taken by Otto Degener, author of the currently appearing *Flora Hawaiiensis.* Mr. Degener, who, incidentally, maintains such groups as *Poinsettia* and *Tithymalus* as distinct genera, writes me that he believes the native Hawaiian species of *Euphorbia* to be capable of segregation. He proposes to describe soon a new genus, this to include all the native Hawaiian species, varieties, and forms given in the following pages. Whether Mr. Degener's view will eventually be embraced by conservative taxonomists, time alone can reveal. His view was known to me, however, several years ago and has been kept in mind throughout my studies.[1] It would seem to me that at the most, and perhaps only in an arbitrary way, the native Hawaiian species could be made to constitute an additional section of *Euphorbia,* standing next to the section *Anisophyllum.* (In Boissier's classical treatment, the native Hawaiian species known to him were placed in sect. *Anisophyllum,* subsects. *Gymnadeniae* and *Sclerophyllae.)*

Several years ago, the large collection of native and introduced species of *Euphorbia* and other genera of the Euphorbiaceae belonging to the Bernice P. Bishop Museum of Honolulu was sent to me for study. This was later supplemented by the still larger collection belonging to Mr. Degener. Both collections included a large quantity of unmounted duplicate material, intended for subsequent distribution and, in the case of

[1] Since the above text was written, Mr. Degener has joined Leon Croizat (Degener, Fl. Haw. Dec. 9, 1936 [originally misprinted November 9, 1936]) in referring all the Hawaiian endemic species to *Chamaesyce.* The new nomenclatural combinations arising from this treatment have been inserted as synonyms in my text, without comment.

the Degener plants, often reaching a total of a dozen or more specimens for a single number. From time to time, through the friendly cooperation of the authorities at Field Museum of Natural History, Chicago, where primarily my work has been carried on, the collections of many of the principal European and American herbaria have been borrowed for examination. In this way it was possible to study directly almost all of the types of the previously described Hawaiian species and varieties of *Euphorbia*. In the very few cases where types, also original descriptions, were inacessible to me, the attendant difficulty has been surmounted through the exceedingly kind assistance of those in charge of certain herbaria and libraries.

To the institutions which, by the cooperation of their directors or staff members, made this revisional study possible, it is a pleasure to acknowledge here my deepest gratitude. Particularly must I express my indebtedness to the following individuals: Miss Ethelyn M. Tucker, Librarian, Arnold Arboretum; Dr. Ludwig Diels, Director, and Dr. Johannes Mattfeld, Curator, Botanical Garden of Berlin; Dr. Herbert E. Gregory, formerly Director, Dr. Peter H. Buck, present Director, Mr. Edwin H. Bryan, Jr., Curator of Collections, and Miss Marie C. Neal, Botanist, Bernice P. Bishop Museum; Dr. John Ramsbottom, Keeper of Botany, British Museum of Natural History; Dr. Karl M. Wiegand, Professor of Botany, Cornell University; Mr. Otto Degener, author of the *Flora Hawaiiensis;* Dr. B. P. G. Hochreutiner, Director of Botanical Garden of Geneva and of Delessert Herbarium; the late Mr. Stephen C. Simms, formerly Director, Dr. B. E. Dahlgren, Head Curator of Botany, Mr. Paul C. Standley, Curator of the Herbarium, and Mr. C. H. Carpenter, Photographer, Field Museum of Natural History; Dr. Carl Skottsberg, Director, Arboretum of Gothenburg; Dr. Elmer Drew Merrill, Administrator of Collections, and Mr. Charles A. Weatherby, Assistant Curator at Gray Herbarium, of Harvard University; Sir Arthur W. Hill, Director, and Dr. J. Hutchinson, Botanist, of the Royal Botanical Gardens of Kew; Dr. Boris Keller, Director, and Dr. V. P. Savicz, Assistant Director, Botanical Garden of Leningrad; the late Dr. Marshall Avery Howe, formerly Director, and Dr.

Henry Allan Gleason, Deputy Director and Head Curator, New York Botanical Garden; Dr. Henri Humbert, Director, Museum of Natural History, Paris; Dr. William R. Maxon, Associate Curator, United States National Museum; Dr. Karl Keissler, Director of the Department of Botany, Natural History Museum, Vienna.

In the foregoing list I have purposely omitted the name of Dr. Jesse More Greenman, in whose honor the present volume is being published and to whom I would here tender special thanks. As one of Dr. Greenman's earliest students in plant taxonomy, it is with a deep sense of gratitude, not only for his aid in lending specimens for the study here represented but for his wise direction and friendly counsel in former years, that I join some of his later students in seeking here to pay him tribute.

I have photographed upwards of one hundred of the more important specimens studied. Complete sets of the photographs are in my private collection and in the herbarium of Field Museum of Natural History, Chicago. These photographs have been drawn upon exclusively for the accompanying plates.

Wherever the term "cotype" is used in the legends accompanying the plates, or elsewhere in the text, it is used to connote a duplicate of the type, as shown, for example, by the use of the same collection number.

Names of institutions or individuals at present possessing the specimens cited in this Revision (and referred to in the text usually by the names or abbreviations in parentheses) follow: Botanical Garden of Berlin (Berlin); Bernice P. Bishop Museum, Honolulu (Bishop); British Museum of Natural History, London (British); Cornell University, Ithaca (Cornell); Mr. Otto Degener, Waialua, Isl. Oahu (Degener); Delessert Herbarium, Geneva (Delessert); Field Museum of Natural History, Chicago (Field); Botanical Museum of the University of Florence (Florence); Arboretum of Gothenburg (Gothenburg); Gray Herbarium of Harvard University, Cambridge (Gray); Royal Botanical Gardens of Kew (Kew); Botanical Garden of Leningrad (Leningrad); Linnean Herbarium, Lon-

don (Linnaeus); University of Minnesota (Minnesota); Missouri Botanical Garden, St. Louis (Missouri); New York Botanical Garden, New York City (New York); Museum of Natural History, Paris (Paris); Academy of Natural Sciences, Philadelphia (Philadelphia); United States National Museum, Washington, D. C. (U. S.); Natural History Museum, Vienna (Vienna).

Genus EUPHORBIA L.

EUPHORBIA L. Gen. Plant., edit. 5, p. 208. 1754.

Herbs, shrubs, or trees, of widely diverse habit, with milky juice, our species leafy; leaves alternate or the upper or all opposite, entire or toothed or rarely lobed; stipules present or absent, in foreign succulent species often transformed into spines (or prickles) above a pair of larger spines; in our native species the two stipules of each interpetiolar space fused into a single body. Flowers aggregated in capitula (cyathia), these resembling small hermaphrodite (or in some foreign species male) flowers; a single capitulum consisting of a number of stamens (really male flowers, each consisting of a single stamen jointed to a pedicel—staminophore—and soon falling away from it, without or rarely with a minute perianth just above the articulation) mingled with membranaceous scales or bracteoles, with (or in some foreign species without) a stipitate ovary (really a pedicellate female flower, with or without a minute 3-lobed or very rarely cup-like or tubular perianth at the base of the ovary, but without a membranaceous tubular involucel surrounding the pedicel) in their midst, contained in a calyx-like cup-shaped involucre. Involucre consisting of an outer series of 1–8 (usually 5) glands; these distinct and equally spaced or rarely united, entire or 2-horned or divided or appendaged at margin with a sometimes petaloid extension, alternating with an inner series of 4–8 (usually 5) membranaceous erect or inflexed fringe-toothed lobes. Anthers 2-celled; cells usually subglobose and more or less diverging, longitudinally dehiscent. Ovary partly or wholly included or (in our species commonly) exserted, 3- (rarely and then only for some foreign species 2-) celled, containing in each cell (coccus) a

single ovule (this pendulous from the apex of the cell's inner angle); styles 3 or rarely 2, free or more or less united below, entire or more or less deeply bifid at apex. Fruit a 3- (rarely 2-) celled capsule; cells separating at maturity from the central persistent axis and opening along their inner face into 2 valves, liberating the seed; inner part of valves hard or cartilaginous. Seeds with a thin crustaceous testa, smooth or variously sculptured, our native species lacking but many other species having a caruncle; embryo straight, with flat cotyledons, enclosed in a thick albumen. (Description of genus based in considerable part upon that by the late Dr. N. E. Brown *in* Thiselton-Dyer, Flora of Tropical Africa **6**: sect. 1: 470. 1911.)

KEY

a. Fruticose or arborescent; leaves all opposite and distichous; stipules on each side fused into a single more or less triangular or crescentic interpetiolar body; involucral glands entire; seeds ecarunculate; native species.
  b. Inflorescence commonly several times branched and becoming 1.5–6 (or even 7.5) cm. long, open, heads usually 5–20.
    c. Capsules 1.3–2.2 cm. long, bright pink to dark crimson or scarlet; pedicels thickish; native of northeastern Oahu.....*3. E. Rockii*
    c. Capsules smaller, pedicels capillary or nearly so.
      d. Leaves scarcely petiolate, petioles 1–3 mm. long; plants of Oahu.
        e. Veins of leaves obscure on upper surface; blade commonly 4–9 cm. long and 2–3.4 cm. wide.....*1. E. Clusiaefolia*
        e. Veins of leaves manifest on upper surface; blade commonly 7–16.5 cm. long and 2.5–4.5 cm. wide.....*2. E. Forbesii*
      d. Leaves definitely petiolate, the slender petioles 5–18 mm. long; native of Kauai.....*4. E. Remyi* var. λ. *kauaiensis*
  b. Inflorescence monocephalous, or if polycephalous at least more contracted, usually less than 1.5 cm. long.
    c. Capitula usually 3–11 in each cyme.
      d. Capitular clusters (that is, cymes) dense and subglobose, 4–8 mm. long; blades of principal leaves obtuse at apex, narrowed at base, 2–3.3 cm. wide; native of Kauai.....*5. E. halemanui*
      d. Capitular clusters mostly longer than broad, or flattened but hardly dense or subglobose.
        e. Leaf-blades oblong-elliptic, at apex mostly subacute to acute; inflorescence 0.5–1.5 cm. long.....*11. E. Hillebrandii* var. β. *palikeana*
        e. Leaf-blades more or less oblanceolate, at apex rounded to obtuse or truncate-emarginate.
          f. Cymes open, the branches slender, capitula pedicelled.
            g. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....*6. E. Celastroides* var. *v. lorifolia*

g. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.
h. Capitula in poly(±11)-cephalous cymes.....
.....*6. E. Celastroides* var. *o. niuensis*
h. Capitula solitary in the axils or clustered in 2–5-cephalous cymes.....*6. E. Celastroides* var. *ξ. hanapepensis*
f. Cymes more contracted, capitula sessile to subsessile.
g. Branchlets thick, conspicuously woody, very nodose; native of northwesternmost Oahu.....*6. E. Celastroides* var. *δ. kaenana*
g. Branchlets delicate, appearing as if subherbaceous, nodes small and farther apart; natives of Kauai.....
.....*8. E. atrococca* and varieties *β. kokeeana* and *γ. kilaueana*
e. Capitula commonly 1–3 to a leaf axil.
d. Principal leaves with mostly orbicular-cordate blades, these commonly 1–2 cm. long.....*14. E. Degeneri* and var. *β. molokaiensis*
d. Principal leaves with ovate-oblong to linear blades.
e. Leaf-blades repand-denticulate.....*12. E. Hookeri*
e. Leaf-blades entire or obsoletely denticulate.
f. Stipular body leaving soon a basal whitish callosity; natives of Kauai and at least formerly of Oahu.....*4. E. Remyi* and vars.
f. Stipular body usually persistent, basal callosity absent or inconspicuous.
g. Leaves apically more or less acute.
h. Leaf-blades ovate; native of western Maui and perhaps also of Lanai.....*12. E. Hookeri* var. *β. integrifolia*
h. Leaf-blades narrower.
i. Leaf-blades narrowly or sometimes broadly oblong-elliptic; natives commonly of Oahu or very rarely of northwesternmost Maui....*11. E. Hillebrandii* and var. *γ. waimanoana*
i. Leaf-blades linear-oblong or oblong-linear; natives of Hawaii and West Maui..*7. E. olowaluana* and var. *β. gracilis*
g. Leaves apically more or less obtuse or rounded to truncate-emarginate.
h. Leaf-blades mostly oval to obovate, commonly 1.5–3.5 cm. wide.....See under first "a" in key for *6. E. Celastroides*
h. Leaf-blades suborbicular to linear (or even more or less obovate but) commonly less than 1.5 cm. wide (or if a few cauline leaves wider, then rameal leaves very numerous and branchlets prominently ridged and often with additional diminutive bracting leaves).
i. Involucral pedicels capillary, somewhat flexuous, becoming 1.5–1.8 cm. long.....*6. E. Celastroides* var. *μ. nematopoda*
i. Involucral pedicels (if present) stouter or shorter or both.
j. Capitula usually many to a branchlet, each node of which may bear a short slender flowering axis in one axil.
k. Capitula sessile to subsessile.
l. Leaf-blades mostly less than 2 cm. long; petiole tomentose.

m. Leaves silvery-tomentulose beneath.....
.....*9. E. multiformis* var. *θ. kaalana*

m. Leaves glabrous on both surfaces.....
.....*9. E. multiformis* var. *ι. perdita*

l. Leaf-blades mostly 3–4.5 cm. long; petiole glabrous
.....*6. E. Celastroides* var. *δ. kaenana*

k. Capitula pedicellate.

l. Capitular pedicels (on well developed specimens) ±13 mm. long....*6. E. Celastroides* var. *λ. Humbertii*

l. Capitular pedicels 3–8 mm. long.

m. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....*6. E. Celastroides* var. *ν. lorifolia*

m. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.....
.....*6. E. Celastroides* var. *ξ. hanapepensis*

j. Capitula few to a branchlet.

k. Capitula sessile or subsessile (pedicel less than 2 mm. long).

l. Mature seeds mostly tetragonal, 1.7–2 mm. long.

m. Leaves mostly broad-obovate to almost rotund.

n. Leaves densely crowded, ultimate branches (unless in form *kahanana)* mostly short and thick like penultimate ones, involucres usually sessile, capsules glabrous or nearly so; native of easternmost Molokai and (*f. kahanana)* eastern Oahu.....
.....*6. E. Celastroides* var. *ι. halawana*

n. Leaves few or many but ultimate branches mostly slender to even capilliform and thus unlike penultimate ones, involucres usually subsessile or short-pedicellate.

o. Capsules appressedly and more or less arachnosely whitish-hispid, finally glabrate at some places; native of northwestern Hawaii..*6. E. Celastroides* var. *κ. saxicola*

o. Capsules glabrous (or perhaps hispid for *13. E. festiva* and *9. E. multiformis* var. *η. tomentella*, natives of Oahu).

p. Young branchlets pubescent.

q. Branchlets, involucres, and pedicels tomentulose .....
.....*9. E. multiformis* var. *η. tomentella*

q. Branchlets spreading-hispidulous.

r. Leaf-blades commonly cuneate-obovate; involucral glands somewhat

spreading; native of East Maui....
...*9. E. multiformis* var. *γ. haleakalana*

r. Leaf-blades more often broad-oval to linear-elliptic; involucral glands appressed; natives of southwestern Oahu and northwesternmost Molokai .....*10. E. Skottsbergii* and vars. *β. kalaeloana* and *γ. audens*

p. Young branchlets glabrous or essentially so.

q. Dwarf shrub up to 6 dm. tall; capitula few, solitary in upper axils; bog plant of southern Kauai.....
.....*9. E. multiformis* var. *ζ. sparsiflora*

q. Shrub or tree, capitula few or numerous.

r. Leaf-blades oblong or more rarely ovate-oblong, at base broadly subcordate or even moderately cordate, on each margin commonly very obsoletely 1–8-denticulate..*13. E. festiva*

r. Leaf-blades variously narrow-oblong to obovate, at base more or less cuneately narrowed, at margins entire *9. E. multiformis* and var. *β. microphylla*

m. Leaves mostly oblanceolate or narrower.

n. Ultimate branchlets capilliform or nearly so .....*9. E. multiformis* var. *δ. kapuleiensis*

n. Ultimate branchlets mostly coarser.

o. Ultimate branchlets slender, often subherbaceous, their internodes rather elongate.

p. Leaves entire.....
.....*9. E. multiformis* var. *ε. manoana*

p. Leaves commonly 3–10-denticulate on each edge..*10. E. Skottsbergii* var. *δ. Vaccinioides*

o. Ultimate branchlets thickish, ligneous, their internodes short.....
.....*6. E. Celastroides* var. *π. amplectens*

l. Mature seeds mostly biconvex, 1-4–1.6 mm. long .....*6. E. Celastroides* var. *ρ. mauiensis*

k. Capitula all or many definitely slender-pedicellate (pedicel 4–7 mm. long).....
.....*6. E. Celastroides* var. *ζ. haupuana*

a. Herbaceous, annual or perennial; introduced species.

b. Involucral glands with petaloid (not corniculate) appendages.

c. Capsule glabrous.....*16. E. Hypericifolia*

c. Capsule pubescent.

d. Capitula in peduncled clusters.....*15. E. hirta*

d. Capitula in axils of leaves or leaf-like bracts.
e. Capsule whitish-ciliate along and sometimes near its angles; stipules on upper side of stem usually distinct linear and pilose, those on lower side united into one deltoid or deltoid-ovate body, this apically laciniate-toothed.....*18. E. prostrata*
e. Capsule apressed-hirtous; stipules all elongately lanceolate-subulate, hairy-fimbriate.....*17. E. Thymifolia*
b. Involucral glands with corniculate appendages or none.
c. Involucral glands exappendiculate.
d. Floral leaves white or pale-pink at base; seeds carinate on outer face.....*20. E. geniculata*
d. Floral leaves commonly red to purplish at base; seeds ecarinate.....*19. E. heterophylla* and var. *β. cyathophora*
c. Involucral glands with corniculate appendages.....*21. E. Peplus*

Section 1. Anisophyllum (Haworth) Röper

Sect. 1. Anisophyllum (Haworth) Röper *in* J. E. Duby, Bot. Gall., p. 412. 1828; genus *Anisophyllum* Haworth, Synops. Plant. Succulent., p. 159. 1812.

Herbs, shrubs, or trees, common in temperate and even more so in tropical regions of the whole world. Leaves opposite in our species, at base more or less oblique. Leaf petioles each with a pair of stipules at base, each stipule fused with the nearer stipule of the opposite pair into a single interpetiolar body. Capitular involucres minute in our species, solitary or cymose; their glands not or rarely (nos. 14 and 15) appendiculate. Bracteoles among the staminate flowers of many-flowered capitula plumose, of few-flowered capitula setaceous or obsolete. Glands 4 or 5 in our species. Seeds without caruncle.—Nos. 1–18.

1. **Euphorbia Clusiaefolia** Hooker & Arnott, Bot. Beechey's Voy., p. 95. 1832; Boissier, Icon. Euphorb., *tab. 1.* 1866.

Anisophyllum nodosum Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 22. 1860.

Chamaesyce Clusiaefolia (Hook. & Arn.) Arthur, Torreya **22**: 30. 1922.

Shrub, suberect and up to 2 m. tall or subprocumbent, branches not rigid. Leaves opposite, petiole about 2–4 mm. long; blade obovate- or elliptic-oblong, commonly 4–9 cm. long

and 2–3.4 cm. wide, at apex obtuse or rounded and often emarginate, at base narrowed and often oblique, at margins revolute, subcoriaceous, very glabrous, veins obscure (lateral ones divaricate); stipules coalesced two into one, this interpetiolar, obtusely triangular, 2–3 mm. tall. Cymes at ends of branches and in uppermost axils, 1.5–3 (more rarely –4.3) cm. long, once or again di- or trichotomous, mostly 3–6-headed. Involucre campanulate to hemispherical, outwardly glabrous to slightly glandular or pubescent, about 2 mm. tall; pedicel slender, stiff, glabrate to sparsely and irregularly pubescent, 6–14 mm. long; the widely stalked glands transversely oblong and reniform, purplish-black when dried, exappendiculate; lobes 4 or 5, short-obovate to ovate-rounded, denticulate; stamens numerous, their bractlets split into linear lobes and fimbriate. Capsule cernuous, glabrous, 6–9 mm. long, the cocci usually somewhat convex on each side of the subobtuse keel; stipe slender, pubescent, 3–5 mm. long. Seeds oblong-cylindric, obscurely 4- or 5-sided, obtuse at both ends, pinkish-white to reddish-brown, glabrous but more or less lengthwise-wrinkled, about 3 mm. long.

Type: Collected by *Lay and Collie* on Captain Beechey's Voyage, Oahu, 1826–27 (Kew).

Distribution: Oahu.

Specimens examined: *Donald Anderson*, open woods, alt. 1200–1300 ft., wet ridge, Kalihi Ridge, Koolau Mountains, Oahu, January 12, 1932 (Bishop); *anon.*, Nuuanu, Oahu (Bishop); *H. F. Bergman*, Konahuanui-Olympus Trail, Oahu, February 25, 1928 (Field); *E. Christophersen & E. Hume 1411*, alt. 500–750 m., Kahuauli ridge, Oahu, December 17, 1930 (Delessert; Field, 2 sheets; Kew); *Otto Degener 3064*, dryish exposed shrubby slope, east rim of Nuuanu Valley leading to summit of Konahuanui, Oahu, February 25, 1928 (Degener, 3 sheets; Field; New York); *Degener & Eichi Masunaga 3095*, moderately dry exposed ridge, above Pauoa Flats on way to summit of Konahuanui, Oahu, April 2, 1926 (Degener, 3 sheets; Field); *Degener, Park, Potter, Bush & Topping 9964*, in open rain-forest near summit, Waimano, Oahu, June 9, 1935 (Degener; Field; Paris); *Degener, Park, Potter, Bush & Topping 9968*, forested rainy ridge, Middle Halawa Ridge, Oahu, May 26, 1935 (Berlin; British; Cornell; Degener; Delessert; Field; Florence; Gray; Kew; Leningrad; Missouri; New York; Paris; Philadelphia; Pomona; Stanford; U. S.; Vienna); *Degener, Park, Potter, Bush & Topping 10029*, near summit, Poamoho Trail, Laie, Oahu, Aug. 18, 1935 (British; Degener; Delessert; Field); *Otto Degener, D. LeRoy Topping & Colin Potter 10075*, middle Halawa, Oahu, November 10, 1935 (Berlin; British; Degener; Delessert; Field; Gray; Kew; Paris; Vienna); *Abbé Urbain Faurie 479*, Kalihi, Oahu, October, 1909

(Bishop; Delessert; Paris); *Charles N. Forbes*, Waiolani Ridge, Lanihuli Trail, Oahu, 1908 (Bishop); *Forbes*, Waiolani, west side of Nuuanu Valley, Oahu, June 28, 1908 (Missouri); *Forbes*, Waiolani, west side of Nuuanu, and Honolulu, Oahu, same date (Field); *Forbes*, Waiolani, July 8, 1908 (Field, 2 sheets; Missouri); *Forbes*, Koolauloa Mts., west of Punaluu Valley, Oahu, May 8–13, 1909 (Field); *Forbes 2550-O*, Konahuanui ridges, Oahu, March 17, 1919 (Berlin; Field); *Forbes & John F. G. Stokes*, Lanihuli Trail, Oahu, June 28, 1908 (Field); *D. Wesley Garber 241*, Konahuanui-Olympus Trail, Oahu, February 15, 1920 (Bishop); *Charles Gaudichaud*, Hawaiian Isls. (Berlin; Gray); *Gaudichaud 283*, same place, September–October, 1836 (Field; Paris); *Amos Arthur Heller 2345*, on lower slopes of Konahuanui, above Manoa, Oahu, May 13, 1895 (Field, 3 sheets); *Heller* (similarly) *2345*, same locality, May 23, 1895 (Cornell; Field; Gray; Kew; Missouri; New York; Paris; U. S.); *Dr. William Hillebrand*, Hawaiian Isls. (U. S.); *Hillebrand*, Nuuanu, Oahu (Kew); *Hillebrand 46*, shrub, alt. 2000–3000 ft., left of Nuuanu, Oahu, May, 1861 (Berlin; Kew; Vienna); *Hillebrand & Rev. John M. Lydgate*, Oahu (Bishop); *A. F. Judd 27*, shrub, vicinity of Kalihi, Oahu, Nov. 4, 1925 (Bishop); *Lay & Collie* (Captain Beechey's Voyage), Oahu (type, Kew); *Horace Mann & William T. Brigham*, Oahu, 1864–1865 (Cornell); *Kasuto Nitta* (Otto Degener's distrib. no.) *8181*, alt. 800 ft., Kipapa, Oahu, November 10, 1929 (Degener); *Joseph F. Rock*, Palolo, Oahu (Field); *Rock*, Konahuanui, Oahu, September, 1912 (Berlin; Field; Kew); *Rock 967*, same locality, January 7, 1909 (Berlin; Delessert; Field, 2 sheets; Kew; Vienna); *Rock 1011*, same locality and date (Gray); *Rock 3037*, Kaukonahua, Wahiawa, Oahu, May 15, 1909 (Delessert); *Topping 3066*, Wahiawa-Waikane, Oahu, March 8, 1925 (N. Y.); *Topping 3276*, Konahuanui, Oahu, February 7, 1926 (Degener); *U. S. Explor. Exped.*, Pearl River and mountains behind Honolulu, Oahu, 1840 (Missouri); *Dr. Heinrich Wawra 1647*, Oahu, 1868–1871 (Vienna, 3 sheets).

Another specimen by Forbes (Koolauloa Mountains, between Punaluu and Kaipapau, Oahu, December 14–21, 1908—Bishop) appears to be a hybrid between *E. Clusiaefolia* and *E. Hillebrandii*.

2. **Euphorbia Forbesii** Sherff, Bot. Gaz. 97: 582. 1936.
Chamaesyce Forbesii (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Glabrous, probably a more or less erect shrub; stem's internodes more often 1.5–3.5 cm. long, brownish-red when dry. Leaves opposite, not numerous, petiole only about 1–3 mm. long; blade oblongly elliptic or oblanceolate, at apex obtuse and often slightly emarginate, at base oblique (and on one side often subcordate), thickish or membranous, slightly revolute, paler beneath, penninervate (lateral nerves numerous, obscure, divaricate), becoming (for the principal leaves) 10–16.5

cm. long and 2.5–4 cm. wide; stipular body widely triangular, narrowed above, about 2 mm. tall. Cymes of inflorescence axillary and terminal, open, more or less decompound (the branches and branchlets not strongly spreading), up to 7.5 cm. long, 8–15-cephalous. Involucre hemispherical, outwardly more or less pubescent, 1.5–3.5 mm. tall; glands 4 or more often 5, very broadly stipitate, transversely oblong (conspicuously reniform), exappendiculate, purplish-black when dry; lobes ovate, hispid; pedicel slender, angulate, sulcate, glabrate or more often minutely spreading-hispidulous, more often 1–2.2 cm. long. Capsule angulate-cylindric, at each end truncate, glabrous, about 6 mm. tall, cernuous, the glabrate stipe about 3-4 mm. long; styles distinct, their branches not conspicuously separated; seeds subtetragonally plano-convex, dorsally carinate, basally truncate, apically obtuse, scrobiculate, pinkish-gray, about 2.8 mm. long.

Type: Collected by *Charles Noyes Forbes*, no. *2218-O*, Wahiawa ditch trail, Oahu, August 17–20, 1915 (Field).

Distribution: Oahu.

Specimens examined: *Degener 8083*, in forest, mountains back of Wahiawa, Oahu, November 25, 1926 (Degener; Field; N. Y.); *Forbes 1623-O*, Wahiawa, Oahu, December 18, 1910 (Field); *Forbes 1770-O pro parte*, Mokuleia, slopes of Puu Kaala, Oahu, April 26–May 16, 1912 (Bishop; Field); *Forbes 2218-O* (type, Field: cotypes, Field; Kew; Missouri); *Edward Y. Hosaka 340*, alt. 1600 ft., South Opaeula Gulch, Paalaa, Koolau Mountains, Oahu, November 9, 1930 (Bishop); *Rock 3037*, Kaukonahua, Wahiawa, Oahu, May 15, 1909 (Field; Gray; New York); *Harold St. John 10629*, shrubs 8 ft. tall, alt. 1800 ft., shady woods on ridge, South Opaeula Gulch, Paalaa, Koolau Mountains, Oahu, November 9, 1930 (Berlin; Delessert; Field; Kew).

Euphorbia Clusiaefolia var. *grandifolia* Hillebr. (Fl. Haw. Isls., p. 395. 1888) was described by Hillebrand evidently from the lone sterile branch preserved in his herbarium (Berlin; the specimen is now before me). This branch came from "Makaleha in the Kaala range" and doubtless belongs either to *E. Forbesii* or to *E. Rockii*.

3. **Euphorbia Rockii** Forbes, Bishop Mus. Occas. Paps. **4**: 214, and *plate*. 1909; Rock, Indig. Trees Haw. Isls., p. 261, *pl. 101*. 1913.

Chamaesyce Rockii (Forbes) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Erect shrub or small tree, glabrous, 1–4 m. tall. Leaves opposite, quite or almost sessile, elliptic-oblong to narrowly obovate-oblong, oblique, clasping at the rounded to cordate base, apically subobtuse, marginally revolute, subcoriaceous, pale underneath, 8–13 cm. long and 2–3 cm. wide; stipular body triangular, subacuminate above, about 2.5 mm. tall. Inflorescence of open, ±13-cephalous cymes at ends of branches and in uppermost axils, 2–6 cm. long. Involucre campanulate, outwardly glabrous or minutely pubescent, internally pubescent, barely 2 mm. tall; pedicel slender, hispidulous, 2–5 mm. long; glands transversely oblong, exappendiculate; lobes minute, ovate, hispid. Styles connate near base, shortly bilobed. Capsules ovoid to obovoid, trigonal (the cocci convex on both sides of their sharply lineate keel), glabrous, bright pink to dark crimson or scarlet, 1.3–2.2 cm. long, the stipe about 4–5.5 mm. long. Seeds globose-cylindric, blackish-brown, glabrous but lengthwise somewhat costate, 3–3.5 mm. long and about 2.6 mm. thick.

Type: Collected by *Charles Noyes Forbes and Joseph F. Rock,* Punaluu Mountains, Oahu, November 14–21, 1908 (Bishop).

Distribution: Northeastern Oahu.

Specimens examined: *Otto Degener, W. Hirai & Kwan Kee Park 8039,* windswept summit, Waikane-Schofield Trail, Oahu, April 4, 1931 (Degener; New York); *Degener, Park & Manuel Kwon 8051,* at summit of Pig God Trail, along rivulet just west of trail in exposed rain forest, overlooking Punaluu Valley, Oahu, January 17, 1932 (Degener, 3 sheets; Field); *Degener, Park, Bush, Potter & Topping 9965,* in rain-forest at summit, Pig God Trail, Punaluu, July 4, 1935 (Berlin; British; Degener; Field; Kew; Paris; Vienna); *Abbé Urbain Faurie 480,* alt. 800 m., Punaluu, Oahu, May, 1910 (British; Paris); *Forbes,* Punaluu Mountains, Oahu, November (not September) 14–21, 1908 (Missouri); *Forbes,* Punaluu Mountains, between Punaluu and Kaipapau, Oahu, same date (Field); *Forbes & Rock,* Punaluu Mts., November 14–21, 1908 (cotype, Field); *Forbes & Thompson,* same locality, May 8–13, 1909 (Berlin; Delessert; Field; Kew); *Edward Y. Hosaka 313,* alt. 2000 ft., Punaluu, Koolau Mountains, Oahu, September 28, 1930 (Bishop); *Raymond Inafuku,* wet ridge, alt. 2700 ft., same locality and date (Bishop); *A. F. Judd,* alt. 2000 ft., in woods, Kaluanui, Punaluu, Oahu, November 19, 1933 (Bishop); *N. H. Krauss,* alt. 1250–2400 ft., Kahana, Waikane-Schofield Trail, Oahu, October 16, 1932 (New York); *S. Nakagawa,* wet woods, Punaluu, half-way to top of Koolau Mountains, Oahu, September 28, 1930 (Bishop); *Rock,* Punaluu

Mountains, Oahu, August, 1908 (Gray; New York); *Rock*, same locality, November, 1914 (Berlin; Delessert; Field; Kew; Paris); *Rock 112*, same locality, November 14–21, 1908 (Berlin; Delessert; Kew; Vienna; really type material); *Rock 412*, shrub with dark crimson capsules, summit ridge of Punaluu, Oahu, December 3–14, 1908 (Bishop); *Rock 697*, Punaluu, Koolau Mountains, December 3, 1908 (Gray); *Dr. Carl Skottsberg 384*, Makaleha Valley, Waianae, Oahu, August 30, 1922 (Bishop); *Skottsberg 1846*, ridges above Kahana Bay, Oahu, September 17, 1926 (Bishop); *Harold St. John 10097*, scarlet fruit, tree 20 ft. tall, alt. 2000 ft., tall wooded stream bank, Kaluanui, Oahu, November 30, 1929 (Berlin; British; Field; Paris); *St. John 10578*, alt. 2300 ft., thicket on crest of ridge, Punaluu, September 28, 1930 (Bishop); *Topping 3271*, Wahiawa-Waikane Trail, Oahu, December 27, 1925 (Degener; New York).

4. Euphorbia Remyi A. Gray *ex* Boissier *in* DC., Prodr. **15**, pt. 2: 1262. 1862.

Euphorbia Remyi var. *α.* A. Gray *ex* Boiss., loc. cit.

Euphorbia Remyi A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 201 (Enum. Haw. Pl., no. 438). 1867 (as to plant, *Remy 598*, from Oahu).

Chamaesyce Remyi (A. Gray) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Inflorescence open, branched, 3–7-cephalous.
  b. Involucres about 3 mm. across the top, capsules with broad lengthwise bands of dense tomentum; plant of northern Kauai....var. *μ. hanaleiensis*
  b. Involucres about 4 mm. across at top, capsules essentially glabrous; plant of southern Kauai.....var. λ. *kauaiensis*
a. Inflorescence of 1 or even 2 or 3 unbranched monocephalous peduncles.
  b. Petioles mostly 1–2 cm. long, slender, blades obtuse at apex..var. *ε. leptopoda*
  b. Petioles mostly less than 1 cm. long, or if longer then robust and margined or with blades subacuminate at apex.
    c. Leaf-blades mostly 4–8.5 cm. long.
      d. Leaf-blades acute or obtuse at apex.
        e. Leaf-blades membranaceous.
          f. Capsules 4 mm. tall.....var. *ι. olokelensis*
          f. Capsules ±2.2 mm. tall.....var. *κ. Wilkesii*
        e. Leaf-blades more or less coriaceous.
          f. Leaf-blades more often obovate-oblong or oblanceolate-oblong, at base more often somewhat narrow and oblique.
            g. Principal leaves 4–5 cm. wide.....var. *β. waimeana*
            g. Principal leaves 1.5–2.5 cm. wide.....var. *θ. molesta*
          f. Leaf-blades not or only a few obovate, at base mostly rounded and equilateral, those of principal leaves 2–3 (more rarely –3.8) cm. wide.....*E. Remyi*
      d. Leaf-blades moderately acuminate at apex.....var. *ζ. kahiliana*

c. Leaf-blades longer.
d. Leaf petioles and midribs narrow.
e. Leaves blunt or rounded at apex.
f. Leaf-blades 6–10 cm. long and 2–4.7 cm. wide.....var. ι. *olokelensis*
f. Leaf-blades 11–15.5 cm. long and 5–7 cm. wide.....var. δ. *Lydgatei*
e. Leaves subacute to subacuminate at apex.
f. Leaf-blades 7–14 cm. long and 3–5 cm. wide.....var. η. *wahiawana*
f. Leaf-blades 6–9 cm. long and 1.5–2.6 cm. wide.....var. κ. *Wilkesii*
d. Leaf petioles and midribs broad, margined.....var. γ. *pteropoda*

Glabrous, probably an ascending or suberect shrub 1–2 m. tall; internodes of stem 0.5–2 cm. long, of slender lateral branches much shorter. Leaves slenderly petiolate with petiole about 3–8 mm. long; blade variously oblong, oblong-elliptic oval or seldom subrhombic-oblong, at obtuse apex somewhat pointed (not emarginate), at base mostly rounded and equilateral, very entire and irregularly revolute, subcoriaceous, subglossy, delicately and numerously penninerved with divaricate nerves, 5–6.5 (a few blades up to 8.5) cm. long and 2–3 (a few up to 3.8) cm. wide; stipular body triangular, about 1–1.5 mm. tall, leaving a basal finally whitish callosity. Peduncles slender, glabrate, 5–10 mm. long, monocephalous, axillary and terminal, solitary or 2 or 3 in a fascicle. Involucre campanulate, outwardly glabrous or glabrate, about 2.4 mm. tall; glands commonly 5, transversely ovate and more or less reniform, exappendiculate; lobes very minute, hirtous. Styles short, their branches short and thickish; capsule dark brown, cernuous on short (±1.5 mm.) glabrate stipe, glabrous, about 3 mm. tall, cocci carinate; seed (apparently submature) stramineous in color, tetragonal, carinate, about 2.1 mm. long, the faces conspicuously scrobiculate.

Type: Collected by *Jules Remy,* no. *598,* Oahu, 1851–1855 (Gray).

Distribution: Known only from Oahu, where apparently not collected since Remy's day.

Specimens examined: *Remy 598* (type, Gray: cotype, Paris).

Confusion has arisen in literature due to Horace Mann's publishing in 1867 *(loc. cit.)* what purported to be an original description of *Euphorbia Remyi* A. Gray, with Kauai cited

first (that is, before Oahu) for the habitat. We must note, however, that some five years previously Boissier *(loc. cit.)* had published *E. Remyi* A. Gray and cited Oahu first. In fact, Boissier listed two varieties, α. and β., and based variety α. directly upon *Remy 598* from Oahu. (For the var. β. see var. κ. *Wilkesii.)*

I have found no other specimens matching the Remy type and cotype (both now before me), and it may well be that the species proper is one of those probably numerous endemic Hawaiian species which have been exterminated within the past century. There are, however, various specimens from Kauai that fall into eleven more or less easily distinguishable varieties of *E. Remyi,* and these are treated below.

Euphorbia Remyi var. β. **waimeana** Sherff, Bot. Gaz. **97.** 584. 1936.

Leaves moderately more coriaceous and revolute, more often obovate-oblong, at base more often oblique and somewhat narrowed, blade commonly about 7–8.5 cm. long and 4–5 cm. wide. A single capitulum without fruit seen.

Type: Collected by *Charles N. Forbes,* no. *1043-K,* Kalalau Pali, Waimea Drainage Basin, west side, Kauai, July 3–August 18, 1917 (Field).

Distribution: Western Kauai.

Specimens examined: *Forbes 1043-K* (type, Field: cotypes, Berlin; Delessert; Field; Kew).

This may be the first of the two forms described by Hillebrand (Fl. Haw. Isls., p. 395. 1888) as having been collected by Knudsen in Waimea. Hillebrand described the stipules as low, triangular, and 1–1.5 lines long. This holds for the very few stipules still observable toward tips of branches on my type, but the stipules lower down are represented merely by the whitish interpetiolar callosities which are conspicuous in this species.

Euphorbia Remyi var. γ. **pteropoda** Sherff, Bot. Gaz. **97:** 585. 1936.

Leaves coarsely petiolate, the broad petiole margined and 6–

12 mm. long; blade widely elliptic-oblong, at times minutely emarginate, moderately revolute, subcoriaceous, 8–11 cm. long and 4–4.8 cm. wide.

Type: Collected by *Abbé Urbain Faurie,* no. *478,* alt. 800 m., Kauhao, Kauai, February, 1910 (Delessert).

Distribution: Northwesternmost Kauai.

Specimens examined: *Faurie 478* (type, Delessert: cotypes, Bishop; Paris).

A variety quite distinct from the species proper and the other varieties in its robust margined leaf petioles and wide leaf midribs. Only in var. *olokelensis* do the leaf petioles or midribs tend at all to simulate those of var. *pteropoda* and then only occasionally and only to a slight extent.

Euphorbia Remyi var. δ. **Lydgatei** Sherff, Bot. Gaz. **97**: 585. 1936.

Leaves slenderly petiolate, petiole 7–10 mm. long; blade oblong-obovate, at apex itself abruptly subacute, at base narrowed and oblique, weakly or scarcely revolute, membranaceous, 11–15.5 cm. long and 5–7 cm. wide, the veins evident.

Type: Collected by *Reverend J. M. Lydgate,* Pole Line Trail, Wailua Mountains, Kauai (Bishop).

Distribution: Eastern Kauai.

Specimens examined: *Lydgate,* Pole Line Trail, Wailua Mts., Kauai (type, Bishop).

Euphorbia Remyi var. ε. **leptopoda** Sherff, Bot. Gaz. **97**: 585. 1936.

Leaves slenderly petiolate, petiole obsoletely hispid and 8–22 mm. long; blade more often elliptic-oblong (rarely ovate-oblong or subrhomboidal-oblong), at apex obtuse and sometimes minutely emarginate, at base rounded or subcordate and more often oblique, not or very narrowly revolute, glossy, more often 9–13 cm. long and 3–4.5 (–5.3) cm. wide.

Type: Collected by *Charles N. Forbes,* no. *1095-K,* Halemanu, Kauai, July 3–August 18, 1917 (Bishop).

Distribution: Central to northwestern Kauai.

Specimens examined: *Otto Degener 8085,* Olokele Canyon, Kauai, July 3, 1926 (Degener, 2 sheets; Field); *Forbes 1095-K* (type, Bishop).

Euphorbia Remyi var. ζ. **kahiliana** Sherff, Bot. Gaz. **97**: 586. 1936 (where misprinted *kalihiana)*.

Leaves slenderly petiolate, petiole 3–6 mm. long; blade subrhomboidal-oblong, at apex commonly somewhat acuminate, at base often oblique and cuneate-rounded, membranaceous, lightly revolute, only 4–7 (more rarely –8.5) cm. long and 2–3.5 cm. wide, the veins obscure above.

Type: Collected by *Charles N. Forbes,* no. *10-K,* foot of Kahili, Kauai, July 8, 1909 (Field, 3 sheets).

Distribution: Southern Kauai.

Specimens examined: *Forbes 10-K* (type, Field, 3 sheets).

Euphorbia Remyi var. η. **wahiawana** Sherff, Bot. Gaz. **97**: 586. 1936.

Leaves slenderly petiolate, petiole 5–15 mm. long; blade now narrowly now widely oblong-obovate, often gradually narrowed to a more or less oblique base, at apex subacuminate, membranaceous, lightly revolute, 7–14 cm. long and 3–5 cm. wide.

Type: Collected by *Charles Noyes Forbes,* no. *177-K,* Wahiawa Mountains, Kauai, August, 1909 (Field).

Distribution: Known only from type locality in Wahiawa Mountains, southern Kauai.

Specimens examined: *Forbes 177-K* (type and cotype, Field); *Rev. John M. Lydgate,* Wahiawa Mts., Kauai (Bishop).

Euphorbia Remyi var. θ. **molesta.** (Pl. 2.)

Varietas nova. Folia numerosa (ramorum internodiis saepius circ. 4–8 mm. longis), petiolo tenui et 4–9 mm. longo; lamina oblanceolata, sensim ad basim inaequilateralem angustata, apice obtusa subacutave, plerumque emarginata, anguste revoluta, subcoriacea, 4–7 (raro –9) cm. longa et 1.5–2.5 cm. lata.

Leaves numerous (internodes of branches more often about 4–8 mm. long), petiole slender and 4–9 mm. long; blade oblanceolate, gradually narrowed to an oblique base, at apex obtuse or subacute, commonly emarginate, narrowly revolute, subcoriaceous, 4–7 (rarely –9) cm. long and 1.5–2.5 cm. wide.

Type: Collected by *Charles Noyes Forbes,* no. *224-K,* Wahiawa Mountains, Kauai, August, 1909 (Field, 2 sheets).

Distribution: Southern Kauai.

Specimens examined: *Forbes 224-K* (Field, 2 type sheets).

Treated in the herbarium by Forbes as a variety of *Euphorbia atrococca* Heller. That species, however, has the inflorescence distributed along delicate lateral branchlets, as in *E. multiformis,* while in our plants they are distributed upon the main woody branches themselves, as in the various varieties of *E. Remyi.*—The varietal name was given in allusion to the somewhat *burdensome* situation arising from having still another variety added to *E. Remyi.*

Euphorbia Remyi var. ι. **olokelensis** Skottsberg & Sherff *ex* Skottsb., Meddel. Göteb. Bot. Trädg. **10**: 121. (Febr. 7,) 1936 (without description); *ex* Sherff, Bot. Gaz. **97**: 586. (Apr. 2,) 1936 (with description).

Leaves narrowly or somewhat widely petiolate, petiole 4–12 mm. long; blade elliptic-oblong or subobovate-oblong, at the often oblique base now cuneate-narrowed now subcordate, at apex obtuse, membranaceous, scarcely or not revolute, 6–10 cm. long and 2–4.7 cm. wide.

Type: Collected by *Dr. Carl Skottsberg,* no. *1050,* innermost part of Olokele Valley, Kauai, October 31, 1922 (Bishop).

Distribution: Central to northwestern Kauai.

Specimens examined: *Charles N. Forbes 456-K,* Olokele Valley, Kauai, September, 1909 (Field); *Albert S. Hitchcock 15220,* alt. 1400 ft., Olokele Gulch, Kauai, October 18, 1916 (U. S.); *Joseph F. Rock 2078,* Halemanu, Kauai, February 14–26, 1909 (Bishop; Gray); *Rock 12936,* Kaholuamanu, Kauai, October, 1916 (Bishop); *Rock 17108,* same locality and date (Bishop); *Skottsberg 1037,* Olokele Canyon, Waimea, Kauai, October 31, 1922 (Gothenburg; juvenile and scarcely typical material); *Skottsberg 1050* (type, Bishop); *Dr. Heinrich Wawra 2036,* Kauai, *1868–1871* (Vienna, 2 sheets).

Rock 17108, which, although coming from Kaholuamanu, is so close to the Olokele specimens that it is not varietally separable, has a mature capsule measuring 4 mm. long, the cocci obtuse on the back. The specimens from the type locality proper are without mature capsules.

Euphorbia Remyi var. κ. **Wilkesii** Sherff, Bot. Gaz. **97**: 587. 1936.

Euphorbia Remyi var. β. Boiss. *in* DC., Prodr. **15**, pt. 2: 1262. 1862.

Leaves narrowly oblong, at base obliquely narrowed, at the subacute or acute apex rarely somewhat subacuminate, very membranaceous, not revolute, the slender petiole about 7–11 mm. long, the blade 6–9 cm. long and 1.5–2.6 cm. wide. Involucre 2 mm. tall. Capsule only about 2.2 mm. tall, cocci acutely carinate and not sulcate; seeds tetraquetrous, their sides scrobiculate; stipe much reflexed.

Type: Collected by the *United States Exploring Expedition*, Kauai, 1840 (U.S.).

Distribution: Kauai, exact part unknown.

Specimens examined: *U. S. Explor. Exped.*, Kauai, 1840 (type, U. S.).

Asa Gray supplied a description of his *Euphorbia Remyi* to Boissier, as is shown in Boissier's citation "A. Gray in litt." and the additional note, "Descr. ex cl. A. Gray in litt." Boissier published the description in 1862. As already stated (see p. 17), Boissier listed two varieties, α. and β., basing α. on *Remy 598, "absque fructu,"* from Oahu, and β. on the material collected by the United States Exploring Expedition (that is, the "Wilkes Expedition"), on Kauai. Gray's description of the species *E. Remyi* included the fruit. But since *Remy 598* was *"absque fructu"* (and this is confirmed by an examination of Gray's ample type specimen now before me), the fruit clearly must have been described from that in the packet of fragmentary but fruiting *U. S. Explor. Exped.* material which Gray had before him and from which (as stated on the label) he sent "a little to Boissier."

Shortly after Boissier's work was published, Horace Mann and William T. Brigham botanized in the Hawaiian Islands (May 4, 1864–May 18, 1865). They collected a specimen with larger, more acuminate leaves and with capsules 4 (not about 2.2) mm. long, the cocci obtuse (not acutely keeled) upon their backs. Asa Gray saw this material; his fragment of it, labeled *"Euphorbia Remyi* n. sp." in his own handwriting, is still pre-

served (Gray). He evidently at once revised his supposedly unpublished description of *E. Remyi* in an attempt to allow for the larger capsules, and Mann, in 1867 (Proc. Amer. Acad. 7: 202; Enum. Haw. Pl., no. 438), published the description as revised. Thus we read: "Capsules small, acutely triangular-3-lobed, and glabrous (immature?), or much larger, 2 lines long, the cocci obtuse on the back." The two types of fruit and even of leaves are varietally incongruous, and I limit the variety *Wilkesii* to plants typified by the original Wilkes (small-fruited) material. (For further consideration of the *Mann & Brigham* plant, see variety μ. *hanaleiensis.)*

Euphorbia Remyi var. λ. **kauaiensis** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 584. 1936.

Leaf petiole slender, 5–18 mm. long; blade elliptic-oblong or more rarely -lanceolate or subrhomboid-oblong, at apex subacute and very rarely emarginate, at the more or less oblique base cuneate-narrowed or rarely subrounded, subglossy, membranaceous, 8–15.5 cm. long and 3–5 cm. wide, penninerved (the lateral nerves divaricate, slender, manifest), very entire, not or very minutely and irregularly revolute. Inflorescence axillary and terminal, irregularly branched (nodules stipuliferous, often 2-budded), 1.5–4 cm. long, commonly 3–7-cephalous. Involucre when dry blackish or purplish-black, hemispherical, outwardly glabrate or toward top hispidulous, 3 mm. tall; glands commonly 5, transversely oblong, exappendiculate; lobes small, hirtous; pedicel slender, blackish, glabrate or sparsely setose (often irregularly and very minutely more or less slender-papillate), more often 7–10 mm. long. Capsule cylindric-ovate, subacutely trigonal, glabrous, shortly stipitate (stipe apparently always straight or nearly so), 3.5–4 mm. tall; styles distinct to the base, the short or very short lobes thickened. Seeds chestnut-colored, acutely tetragonal, at base truncate, at apex obtuse, on faces scrobiculate, about 2–2.2 mm. long.

Type: Collected by *Otto Degener,* no. *8093,* near Hanapepe Falls, Kauai, June 19, 1926 (Field).

Distribution: Southern Kauai.

Specimens examined: *Degener 8093* (type, New York; cotypes, Degener, 2 sheets; Field).

Euphorbia Remyi var. μ. **hanaleiensis** Sherff, Bot. Gaz. **97**: 588. 1936.

Leaves membranaceous, the slender petiole ±8 mm. long; blade broadly oblanceolate-oblong, at apex subacuminate, ±12.5 cm. long. Inflorescence very delicate, ±1.7 cm. long, branched, ±4-cephalous, the slender pedicels glabrous and 4–7 mm. long; involucre ±3 mm. across, tomentulose above; cocci densely tomentulose toward margins, about 4 mm. long; seeds tetragonal, scrobiculate, about 3 mm. long.

Type: Collected by *Horace Mann* and *William T. Brigham*, Hanalei, Kauai, 1864–1865 (Cornell).

Distribution: Northernmost Kauai.

Specimens examined: *Mann & Brigham*, Hanalei, Kauai, 1864–1865 (type, Cornell: cotype fragment, Gray).

5. **Euphorbia halemanui** Sherff, Bot. Gaz. **97**: 582. 1936. (Pl. 3.)

Chamaesyce halemanui (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Glabrous, probably a shrub 1–2 m. tall, internodes of branches commonly 0.5–1.5 cm. long. Leaves opposite, petiole slender and 5–10 mm. long; blade elliptically or sometimes subrhomboidally oblong or obovate, at apex obtuse and not emarginate, at base narrowed but scarcely oblique, at margins not or scarcely subrevolute, pinnately nerved (nerves divaricate, on upper surface often obscure), 4.5–8 cm. long and 2–3.3 cm. wide; stipular body triangular, scarious, 1–2 mm. tall, its upper margin fimbriate. Inflorescences axillary and terminal, contracted, globose, only 4–8 mm. tall, each of about 4–10 capitula. Involucre urceolate, outwardly glabrous, under 2 mm. tall; glands 4 or 5, transversely oblong, exappendiculate; pedicel minute, glabrous, under 3 mm. long; staminophores numerous, exserted. Capsule (submature) cernuous, very glabrous, trigonous, 2.2 mm. tall; cocci subacutely carinate; stipe glabrous, up to 3 mm. long; styles very distinct to the base, their short branches thickened.

Type: Collected by *Charles N. Forbes*, no. *1095-(a)K*, Halemanu, Kauai, July 3–August 18, 1917 (Bishop).

Distribution: Northwestern Kauai.

Specimens examined: *Forbes 943-K*, Halemanu, Kauai, July 3–August 18, 1917 (Bishop); *Forbes 1095-(a)K* (type, Bishop); *Dr. Carl Skottsberg 1002*, forest near Kokee Ranger Station, Kauai, October 28, 1922 (Bishop).

Noticeable for its minute globose very much contracted clusters of heads, a cluster usually measuring 4–7 mm. tall.

6. Euphorbia Celastroides Boissier *in* DC. Prodr. **15**, pt. 2: 11. 1862; Christoph. & Caum, Bishop Mus. Bull. no. 81: 6, *pl. 2-B*. 1931.

Euphorbia multiformis var. *Celastroides* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. ε.). 1867.

Chamaesyce Celastroides (Boiss.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Leaves mostly oval to obovate, commonly 1.5–3.5 cm. broad.
  b. Leaves mostly oval to subrhombic-oval; pedicel 1–3 mm. long.
    c. Leaves mostly subrhombic-oval, basally broad (4–8 mm.) and truncate-subcordate; plant of northeastern Molokai.....var. *ε. waikoluensis*
    c. Leaves rarely somewhat subrhomboidal, few basally broad or truncate-subcordate.....var. *η. kohalana*
  b. Leaves broadly to narrowly obovate.
    c. Many leaves indented once on each side near apex (with a resulting broad short terminal often emarginate lobe).....var. *β. Stokesii*
    c. Leaves never (or in var. *γ. moomomiana* rarely) thus indented.
      d. Leaves very numerous and conspicuously imbricate-distichous, more often reflexed; capitula solitary or 2–5 on thickened and abbreviated axillary axis; plant of western Molokai and Kaula.....var. *γ. moomomiana*
      d. Leaves otherwise.
        e. Leaves thickish; plant of Nihoa, Niihau, and westernmost Kauai.....*E. Celastroides*
        e. Leaves thinner, at least when dry; plant of easternmost Kauai.....var. *θ. kealiana*
a. Leaves oval or obovate to linear, commonly less than 1.5 cm. wide (or if a few cauline leaves wider, then rameal leaves very numerous and branchlets prominently ridged and often with additional diminutive bracting leaves —var. *ι. halawana*).
  b. Involucral pedicels capillary, somewhat flexuous, becoming 1.5–1.8 cm. long.....var. *μ. nematopoda*
  b. Involucral pedicels (if present) stouter or shorter or both.
    c. Capitula in poly(±11)-cephalous cymes.....var. *ο. niuensis*

c. Capitula mostly 1–7 at a node.
d. Capitula usually many to a branchlet, each node of which may bear a short slender flowering axis in one axil.
e. Capitula mostly 1 to a node, pedicel ±13 mm. long..var. λ. *Humbertii*
e. Capitula (at least in well developed specimens) mostly in 2–7-cephalous cymes.
f. Cymes much contracted, their axis and branches thickish and nodose (and thus numerously stipulate-bracted), capitula sessile to subsessile.....var. δ. *kaenana*
f. Cymes open, the branches slender, capitula pedicelled.
g. Leaves noticeably divaricate (except for terminal 1 or 2 pairs, which are antrorse) and distichous, more or less falcate, often 5–7 cm. long.....var. ν. *lorifolia*
g. Leaves directed variously, not or scarcely falcate, seldom more than 5 cm. long.....var. ξ. *hanapepensis*
d. Capitula few to a branchlet.
e. Capitula sessile or subsessile (pedicel less than 2 mm. long).
f. Mature seeds mostly tetragonal, 1.7–2 mm. long.
g. Leaves mostly broad-obovate to almost rotund.
h. Leaves densely crowded, ultimate branches (unless in form *kahanana)* mostly short and thick like penultimate ones, involucres usually sessile, capsules glabrous or nearly so; plant of northeasternmost Molokai and (f. *kahanana)* eastern Oahu.....var. ι. *halawana*
h. Leaves fewer, ultimate branches mostly slender (1–1.5 mm. thick) and thus abruptly unlike penultimate ones, involucres usually subsessile, capsules appressedly and more or less arachnosely whitish-hispid (finally glabrate at some places); plant of northwestern Hawaii.....var. κ. *saxicola*
g. Leaves mostly oblanceolate or narrower.....var. π. *amplectens*
f. Mature seeds mostly biconvex, 1.4–1.6 mm. long....var. ρ. *mauiensis*
e. Capitula all or many definitely slender-pedicellate (pedicel 4–7 mm. long).....var. ζ. *haupuana*

Shrub, glabrous, glaucous, spreadingly branched and often forming dense mats; branches rather closely but not widely nodose, often reddish. Leaves opposite and distichous, sometimes a few pairs imbricately crowded at tips of branches, the rather narrow petiole concave or channeled on upper surface and about 2–4 mm. long; blade spatulately cuneate-obovate to oblong-oblanceolate (often with one edge concave and one convex), obtuse to orbicular at apex but not or scarcely retuse, gradually narrowed below to a slender truncate-subcordate base, at margin entire and at times somewhat upturned, somewhat rigid, commonly 2.5–5.5 cm. long and 1–2.5 cm. wide, the

lateral veins more or less obscure on upper surface; stipules coalesced into a single interpetiolar body on each side, this very broad, short, more or less ciliate. Cymes axillary, 1-5-cephalous. Involucre hemispherical, many-flowered, glabrate outside unless at lobes, hirtous inside along lines running from the glands, about 2.3 mm. tall; glands 4 or 5, yellowish-brown when dry (or yellow on living specimens); transversely deltoid-oblong to suborbicular, exappendiculate; stamens exserted; pedicel slender, glabrous, usually becoming about 1 cm. long. Capsule subsessile, blackish or black, trigonal, depressed, about 2.5 mm. tall; cocci scarcely carinate; styles very short, bifurcate about one third the way into thickish apically capitate branches; seeds reddish-gray, obscurely 4-sided, ovate in side view, minutely scrobiculate, about 1.5 mm. long.

Type: Collected by *Jules Remy*, Niihau, 1851–1855 (Paris).

Distribution: Nihoa, Niihau, and western coast of Kauai.

Specimens examined: *Edwin H. Bryan, Jr. 6*, abundant patches on summit and a few plants on southeast point, Nihoa, June 14, 1923 (Bishop); *Edward L. Caum 64*, alt. ±100 m. and ±300 m., among rocks on edge of windswept cliffs, Nihoa, June 17, 1923 (Bishop); *Otto Degener 8090*, growing only on sand dunes in hot arid region, north of Barking Sands, Kauai, June 13, 1926 (Degener, 2 sheets; Field); *C. S. Judd 5*, alt. 140 m., steep rocky hillside, Nihoa, June 20, 1923 (Bishop); *John F. G. Stokes*, Kaali, Niihau, January, 1912 (Bishop).

Boissier omits the color of the capsules but these are found to be blackish or even black on the fruiting specimens examined (*Bryan 6* and *Degener 8090*).

Perhaps hybridizing, through one of its varieties, with *E. Hillebrandii* (*cf. Otto Degener, Kwan Park & Will Bush 8042*, moderately dry region, small gulch on south side of upper Makua Valley, Oahu, May 10, 1931 [Degener; New York]; *Albert F. Judd & Carl Skottsberg 366*, slope of Puu Kaala, Makaleha, Oahu, August 30, 1922 [Gothenburg]), and with *E. multiformis* var. *manoana* (*cf. Charles N. Forbes 2472-O*, ridges between Niu and Wailupe, Oahu, April 11, 1917 [Bishop]; *Otto Degener, Kwan Park, D. LeRoy Topping & Otto Swezey 8100*, top of ridge in open sunny woods, middle ridge of Niu Valley, Oahu, June 4, 1932 [Degener; Field, 2 sheets; N. Y.]).

Euphorbia Celastroides var. β. **Stokesii** (Forbes) Sherff, Bot. Gaz. **97**: 593. 1936.

Euphorbia Stokesii Forbes, Bishop Mus. Occas. Paps., **5**: 108, *pl. 1.* 1913.

Low prostrate shrub 6 dm. tall; branches slender and terminally subherbaceous somewhat as in *E. multiformis*. Leaves obovate, often emarginate (some having the terminal portion partly set off from rest by an additional indentation on each side), somewhat fleshy, bluish-green above, paler beneath, 3–4.2 cm. long and 2–2.8 cm. wide, moderately membranaceous when dry. Capitula solitary, axillary; pedicel 1–1.5 cm. long. Capsule glabrous, 3 mm. tall.

Type: Collected by *John F. G. Stokes*, near the beach at Kii, Niihau, January, 1912 (Bishop).

Distribution: Northeasternmost Niihau and northeastern Kauai.

Specimens examined: *Stokes*, near beach at Kii, Niihau, January, 1912 (cotype, Bishop); *Stokes*, near Kalihiwai, Kauai, February, 1916 (Bishop).

Characterized by its more slender branchlets, the often present low terminal foliar lobe (manifest because of the two additional emarginations), and by its greenish capsules. Connected with *E. Celastroides* too well, however, by the variety *moomomiana*, which unites, for example, the green capsules and, though only to a slight extent, the terminal leaf lobe (characters of var. *Stokesii)* with a robust branching habit and, though only to a slight extent, imbricately crowded leaves (characters of the species proper).

Euphorbia Celastroides var. γ. **moomomiana** Sherff, Bot. Gaz. 97: 593. 1936. (Pl. 4.)

Much branched; branches reddish, thick, very densely leaved, internodes commonly 3–6 mm. thick and twice or thrice as long. Leaves conspicuously distichous and imbricate, more often reflexed; blade somewhat rigid, obovate, at apex rounded or truncate sometimes emarginate (rarely with an additional small sinus a few mm. to each side of the midrib's terminus), gradually narrowed to a minutely auriculate-cordate base, at margin entire and somewhat revolute, bluish-green, paler beneath, 3–4.8 cm. long and 1.8–2.8 cm. wide; stipular body marginally fimbriate-hispid, 1.5–3.2 mm. tall. Capitula solitary and axillary or 2–5 on thickened abbreviated axis arising from

an axil; pedicel glabrous, ±1 cm. long. Capsule about 2 mm. tall and almost 3 mm. thick.

Type: Collected by *Joseph F. Rock*, no. *14014*, Moomomi, Molokai, April, 1918 (Bishop, 3 sheets).

Distribution: Western Molokai and Kaula, islet off Niihau.

Specimens examined: *Edward L. Caum 10*, Kaula, islet off Niihau, August 17, 1932 (Bishop); *Otto Degener 8069*, forming 1 × 2-yard mass, in pure sand on leeward side of large dune, extremely dry region, Moomomi, Molokai, April 25, 1928 (Degener, 2 sheets; Field; New York); *George C. Munro 494*, Moomomi sand hills, Molokai, July 26, 1922 (Bishop); *Rock 14014* (3 type sheets, Bishop).

The *Munro* plant appears to have been regarded as new by Rock, but at the Bishop Museum both the *Munro* and the *Rock* plants had been referred to the deceptively similar *Euphorbia Stokesii* (my variety *Stokesii*). The latter plant differs strongly, however, in having: rameal internodes much shorter and thicker; the much more numerous leaves so close that in the herbarium specimens they present a highly imbricated effect, their blade only very rarely with an indentation on each side of and a few millimeters from the midnerve's distal end; the tendency to bear thickened abbreviated axillary branches which are mere axes to hold the capitula; the shorter capsule, etc.

Euphorbia Celastroides var. δ. **kaenana** Sherff, Bot. Gaz. 97: 594. 1936. (Pl. 5.)

Shrub with thick very nodose branches, bark often whitish-gray and, when dry, lengthwise much wrinkled. Leaves somewhat clustered over distal third or half of the much reduced thickish (2–4 mm.) ultimate branchlets, lower ones often reflexed; petiole slender, glabrous, 2–3 mm. long; blade broadly to narrowly oblong-oblanceolate, at apex obtuse to truncate-subemarginate, cuneately or subcuneately narrowed below to an oblique and truncate-subcordate base (this 3–5 mm. wide), pale green, thin, mostly 3–4.5 cm. long and 1–1.6 cm. wide. Cymes much contracted, their axis and branches thickish and nodose (the numerous stipular bracts very obvious); capitula often 5–7, sessile to subsessile; involucre outwardly glabrate or minutely setulose except for the hirsute lobes. Capsule sub-

sessile, glabrate, drying blackish, about 2.5 mm. tall; seeds grayish over red undercoat, biconvex-tetragonal, scrobiculate, obliquely tetragonal at each end, 1.2–1.4 mm. long.

Type: Collected by *Vaughan MacCaughey,* Kaena uplands, Oahu, March 28, 1915 (Bishop).

Distribution: Northwesternmost Oahu.

Specimens examined: *Otto Degener, W. Hirai,* and *Kwan Kee Park 8038,* among rocks in arid region, near Kaena Point, Oahu, March 21, 1931 (Degener; Field; New York); *Charles N. Forbes 1654-O,* between Makua Valley and Kaena Point, Oahu, February 25, 1911 (Field); *Forbes* (with *Dean Lake) 2280-O,* talus slopes, Kaena Point, Oahu, December 16, 1915 (Bishop); *MacCaughey,* Kaena uplands, Oahu, March 28, 1915 (type, Bishop).

Euphorbia Celastroides var. ε. **waikoluensis** Sherff, Bot. Gaz. **97**: 594. 1936.

Shrub with moderately slender reddish branches. Leaves moderately numerous but seldom imbricate, pale or glaucescent, the dark and minutely puberulous petiole only about 1–2 mm. long; blade subrhombic-oval, apically obtuse to rounded and sometimes slightly emarginate, basally broad (4–8 mm.) and truncate-subcordate, commonly 2.5–3.8 cm. long and 1.5–2.5 cm. wide. Capitula (only a few seen) solitary or subsolitary, axillary or terminal, the involucre pubescent especially above; pedicel short (1–3 mm.). Capsule (a single immature one seen) black.

Type: Collected by *Joseph F. Rock,* no. *6191,* on beach of Waikolu, Molokai (Field).

Distribution: Northeastern Molokai.

Specimens examined: *Rock 6191* (type, Field: cotype, Field).

Euphorbia Celastroides var. ζ. **haupuana** Sherff, Bot. Gaz. **97**: 594. 1936.

Doubtless a shrub; the woody branches slender, grayish-black, the ultimate ones numerously and conspicuously nodose (their internodes mostly 3–7 mm. long and 1–2.5 mm. thick). Leaves as in species proper and somewhat crowded at ends of branches but smaller (blade commonly under 3 cm. long and 2 cm. wide) and at apex commonly obtuse very rarely retuse. Capitula usually not more than 1 or 2 at a node, the slender

glabrous pedicel 4–7 mm. long. A single very immature capsule observed, this black.

Type: Collected by *Joseph F. Rock,* no. *2444,* Haupu-Lihue, Kauai, March 18, 1909 (Bishop).

Distribution: Southeastern Kauai.

Specimens examined: *Charles N. Forbes 20-K pro parte,* near Lihue, Kauai, July 9, 1909 (Field); *Forbes 600-K,* Nonou Mountains, Kauai, October 16–17, 1916 (Field); *Rock 2444* (type, Bishop: cotype, Gray).

Euphorbia Celastroides var. *η.* **kohalana** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 595. 1936.

A shrub of open branching habit; the reddish branches slender and with long internodes (often 2–4 cm.), the nodes inconspicuous; ultimate branches very slender (±1 mm. thick), moderately leafy and often bearing 1 or 2 very short-pedicellate (1–3 mm.) capitula at the tip and at 1 or 2 nodes. Leaves more narrowly petiolate; the blade from oval to obovate (rarely somewhat subrhomboidal), at apex rounded to emarginate, bluish-green or glaucescent, at the more or less oblique base narrowly or widely rounded to truncate-subcordate, 2.5–4 cm. long and 1.5–2.5 cm. wide.

Type: Collected by *Otto Degener,* no. *8037,* Kohala, Hawaii, March 22, 1930 (Delessert).

Distribution: Northwestern Hawaii.

Specimens examined: *Degener 8037* (type, Delessert: cotypes, Field, 2 sheets; New York); *Rock 14032,* without data (Bishop; a specimen without flowers or fruits and with the leaves mostly less blunt or rounded at apex).

Euphorbia Celastroides var. *θ.* **kealiana** Sherff, Bot. Gaz. **97**: 595. 1936.

Doubtless a shrub and more or less matting; branches blackish, nodes numerous and conspicuous, internodes now 3–7 mm. now ±1 cm. long and ±3 mm. (or for ultimate branches 1–1.5 mm.) thick. Leaves as in species proper but drying thinner, blade becoming 5 cm. long and 3.3 cm. wide, probably somewhat differently colored. Capitula not seen.

Type: Collected by *Abbé Urbain Faurie,* no. *477,* on rocks of the shore at Kealia, Kauai, January, 1910 (British).

Distribution: Southeastern Kauai.

Specimens examined: *Faurie 477* (type, British: cotype, Paris); *Charles N. Forbes 20-K pro parte*, near Lihue, Kauai, July 9, 1909 (Field).

Euphorbia Celastroides var. i. **halawana** Sherff, Bot. Gaz. **97**: 596. 1936. (Pl. 6.)

A much-branched and very leafy shrub, doubtless often forming mats; the ultimate and subultimate reddish branches lengthwise much wrinkled and ridged at least when dry, their internodes mostly 1–2 mm. thick. Leaves more persistent on branchlets than in species proper and foregoing varieties, with a brownish tinge when dry, averaging much smaller; petiole slender, 1–2 (rarely –3) mm. long; blade variously oval-obovate, subrhombic-obovate, or suborbicular, at apex rounded to truncate-emarginate, at the oblique and usually widish base rounded to truncate-subcordate, for a few cauline leaves up to 3.5 cm. long and 2 cm. wide but for the multitude of rameal smaller ones mostly 1–2.5 cm. long and 0.8–2 cm. wide (or *for the minute often numerous leaves subtending capitula* down to ±4 mm. long and to ±4 mm. wide). Capitula subsessile, usually solitary, often borne at and near tip of diminutive leafy-bracted lateral branchlet; involucre outwardly tomentose at least above. Capsule glabrous or slightly pubescent, greenish-brown, sessile or apparently so, ±3 mm. tall; seeds grayish, scrobiculate, 2 mm. long.

Type: Collected by *Joseph F. Rock*, no. *14041*, near Halawa, Molokai, April, 1918 (Bishop).

Distribution: Northeasternmost Molokai.

Specimens examined: *Otto Degener 8054*, dry coastal cliffs, west side of Halawa Valley, Molokai, June 20, 1928 (Field, 2 sheets); *Abbé Urbain Faurie 472*, on shore at Halawa, Molokai, June, 1909 (British; Paris); *Rock 14041* (type, Bishop: cotype, Bishop).

Euphorbia Celastroides var. **halawana** f. 1. **kahanana** Sherff, Bot. Gaz. **97**: 596. 1936.

Branchlets less roughened or ribbed when dry, leaves more numerous, inflorescences more often subtended with very small leaves.

Type: Collected by *Otto Degener*, no. 8036, on sunny ridge, west slope of Kahana Valley, Oahu, February 26, 1929 (Degener).

Distribution: Known only from type locality on Oahu.

Specimens examined: *Degener 8036* (type, Degener; cotypes, Field; N. Y.).

Euphorbia Celastroides var. κ. **saxicola** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 596. 1936.

Euphorbia oahuensis Skottsberg, Meddel. Göteb. Bot. Trädg. **10**: 122. 1936 *(ex syn.* Hillebr. but excluding Skottsberg's plant).

Somewhat resembling the variety *halawana* in habit. Leaves averaging slightly smaller and more often obovate, with apex emarginate. Involucre commonly with a short (1–4 mm.) but manifest pedicel. Capsule (sessile) drying brownish-black to black.

Type: Collected by *Otto Degener,* no. 8088, along rocky shore, Kohala, Hawaii, August 9, 1926 (Delessert).

Distribution: Northwestern Hawaii and southeastern Oahu.

Specimens examined: *Degener 8088* (type, Delessert: cotypes, Degener, 2 sheets; Field); *Dr. William Hillebrand,* Kailua, Oahu (Berlin; type of *Euphorbia oahuensis* Skottsberg).

Euphorbia Celastroides var. λ. **Humbertii** Sherff, Bot. Gaz. **97**: 596. 1936.

Probably a shrub; branches ascending, slender, ultimate ones mostly 1–1.6 mm. thick at internodes (these more often 3–9 mm. long), nodes conspicuous. Leaves moderately crowded on distal third or half of each branchlet, the slender petiole 2–4 mm. long; blade cuneately and often subfalcately oblanceolate, apically obtuse to truncate or rounded but seldom retuse, basally oblique-truncate and only about 1.5–3 mm. wide, bluish-green or glaucescent, thinnish, commonly 2–4 cm. long and 0.7–1.5 cm. wide. Capitula abundant but usually only 1 or 2 at a node, mostly elongate-pedicellate; involucre outwardly glabrate, pedicel slender, rigid, suberect, and finally ±13 mm. long. Capsule glabrous, sessile or apparently so, ripening brownish-black, about 2.5 mm. tall.

Type: Collected by *Jules Remy,* no. *595,* Kauai, 1851–1855 (Gray).

Distribution: Oahu and Kauai.

Specimens examined: *Thomas Nuttall*, Parri ("probably Nuuanu Pali"), Oahu (Kew; type material of *Euphorbia annulata* Nutt. ined.); *Remy 595* (type, Gray: cotypes, Paris, 2 sheets); *U. S. Explor. Exped.*, Oahu, 1840 (Gray; Missouri; U. S.).

Named for Professor H. Humbert of Paris, without whose invaluable assistance my treatments of this and several other members of the genus *Euphorbia* would have been greatly handicapped if not precluded.

Euphorbia Celastroides var. μ. **nematopoda** Sherff, Bot. Gaz. **97**: 597. 1936.

Similar to var. *Humbertii*. Differs in its less crowded leaves, fewer capitula, these on more flexuous, not rigid and suberect, even more delicate, and a third to a half longer pedicels.

Type: Collected by *Charles N. Forbes*, no. *726-K*, at left-hand side of Kipu Kai Gap, Haupu Range, Kauai, November 1, 1916 (Bishop).

Distribution: Known only from type locality in southeastern Kauai.

Specimens examined: *Forbes 726-K* (type, Bishop).

Euphorbia Celastroides var. ν. **lorifolia** (A. Gray) Sherff, Bot. Gaz. **97**: 597. 1936.

Euphorbia multiformis var. *lorifolia* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. δ.). 1867.

Euphorbia lorifolia Hillebrand, Fl. Haw. Isls., p. 395. 1888, only as to syn. A. Gray.

Euphorbia rivularis Heller, Minn. Bot. Studs. **1**: 846, *pl. 51*. 1897.

Chamaesyce lorifolia (A. Gray) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936 *(ex syn. Hillebr. quoad Hillebr. syn. A. Grayi utitur)*.

A shrub 1.5–1.8 m. tall, simple below with a stem ±2.5 cm. thick; branches loose, spreading. Differs from variety *Humbertii* in its more conspicuously distichous, more elongate, more often falcate leaves, these often 7 cm. long; also in its commonly more compound inflorescence (often with 3–5-cephalous cymes) and shorter pedicels, these latter mostly ±5 mm.

long. Seeds tetragonal, grayish over red undercoat, distinctly scrobiculate.

Type: Collected by the *United States Exploring Expedition*, Kauai, 1840 (U. S.).

Specimens examined: *Anon.*, Kauai (Bishop, fragment *ex* Berlin); *anon. 415*, near Waimea Canyon, Kauai, June 29, 1928 (Field); *Brodie 4036*, Kauai (Field); *Otto Degener H-212*, near rain forest along irrigation ditch road, Olokele Canyon, Kauai, September 9, 1922 (New York); *Degener 8086*, Olokele Canyon, Kauai, July 3, 1926 (Degener, 3 sheets; Field); *Degener 8091*, rather dry region, northeast of Kipu, Kauai, June 17, 1926 (Degener, 3 sheets; Field); *Degener 8092*, near Hanapepe Falls, Kauai, June 19, 1926 (Degener, 2 sheets; Field; New York); *Abbé Urbain Faurie 465*, Waimea, Kauai, March, 1910 (Paris); *Faurie 466*, Naapali, Kauai, January, 1910 (British; Paris); *Charles N. Forbes*, Olokele Valley, Kauai, September, 1909 (Bishop); *Forbes 944-K*, Halemanu, Kauai, July 3–August 18, 1917 (Field, 2 sheets); *Amos Arthur Heller*, on Kaholuamanu, above Waimea, Kauai, September 2–9, 1895 (Field); *Heller 2441*, on the Hanapepe and Wahiawa Watershed, Kauai, June 25, 1895 (Kew); *Heller* (similarly) *2441*, along the Hanapepe River, near the Falls, Kauai, June 24–26, 1895 (cotypes of *Euphorbia rivularis* Heller, Cornell; Field, 3 sheets; Gray; New York; Paris); *Heller* (similarly) *2441*, same locality, July 2–8, 1895 (Missouri); *Dr. William Hillebrand*, Hawaiian Isls. (Gray; Kew); *Albert S. Hitchcock 15251*, alt. 1400 ft., Olokele Gulch, Kauai, October 18, 1916 (U. S.); *Knudsen*, Kauai (Berlin); *Archibald Menzies*, Hawaiian Isls. (Kew); *Joseph F. Rock 2080*, Halemanu, Kauai, February 14–26, 1909 (Bishop; Gray; New York); *Rock 5564*, Kaholuamanu, Kauai, September, 1909 (Bishop; Gray; New York; Vienna); *Rock 12938*, same locality, October, 1916 (Bishop); *Rock 17257*, Hawaiian Isls. (Bishop); *Carl Skottsberg 1001*, in the forest near Kokee station, Kauai, October 28, 1922 (Bishop); *U. S. Explor. Exped.*, Kauai, 1840 (type, U. S.: type fragments, Gray; Missouri).

The leaves tend to stand "at right angles to the branch, except the ultimate ones, which extend forward" (Heller, *loc. cit.*).

Our concept for the variety *lorifolia* must rest directly upon Asa Gray's manuscript description published by Horace Mann (and its underlying type plant collected by the United States Exploring Expedition): "Var. β *lorifolia* (Gray, *l. c.* ined.): foliis lineari-elongatis (bipollicaribus) crassis; pedicellis involucro 2–4-plo longioribus."

Mann erroneously referred *Mann & Brigham 389* to the variety *lorifolia*, and subsequent botanists, beginning with Hillebrand, seem uniformly to have rested their concept for *lorifolia* upon the *Mann & Brigham* plant. We may note, however, that that very keen student of Euphorbiaceae, Dr. George Engel-

mann, made a carefully detailed study of a fragment of the type of variety *lorifolia,* and that his extended description, in pencil, is on a slip attached to his private herbarium sheet (Missouri). He studied also *Mann & Brigham 389* and wrote: "seed different from *lorifolia* and very distinct."

The *Mann & Brigham* plant is referred by me to variety *mauiensis.* The true variety *lorifolia* is seen to be the plant described by Heller *(loc. cit.)* as *Euphorbia rivularis.*

Euphorbia Celastroides var. ξ. **hanapepensis** Sherff, Bot. Gaz. **97**: 597. 1936. (Pl. 7.)

Euphorbia Celastroides Heller, Minn. Bot. Studs. **1**: 844. 1897 (not Boiss.).

A small tree with short trunk, loosely branching; the smaller or younger branches stiff and with short (commonly 5–12 mm.) internodes, brownish-black or grayish-black at least when dry. Leaves somewhat crowded toward tips of branchlets, petiole slender and 1–4 mm. long; blade linear-oblanceolate to broadly oblanceolate, at apex rounded to subobtuse, at base narrow (usually less than 3 mm. wide), thinner and more greenish above than in species proper and somewhat yellowish-silvery beneath, 2–5 cm. long and 0.7–1.7 cm. wide. Capitula much more numerous than in species proper, solitary at the nodes or more often in 2–5-cephalous cymes (these in axils of abbreviated leafy lateral branchlets); involucre outwardly glabrous; pedicel slender, glabrous, 3–8 mm. long. Capsule glabrous, drying dark brown, sessile or apparently so; seeds grayish, scrobiculate.

Type: Collected by *Amos Arthur Heller,* no. *2429,* along the Hanapepe River, near the Falls, Kauai, July 2–8, 1895 (Missouri).

Distribution: Southeastern Kauai.

Specimens examined: *Abbé Urbain Faurie 476,* on rocks, Hanamaulu, Kauai, December, 1909 (Bishop; Delessert; Paris); *Heller 2429,* along the Hanapepe River, near the Falls, Kauai, June 24–26, 1895 (Cornell; Field, 2 sheets; Gray; New York; Paris); *Heller* (similarly) *2429,* on the Hanapepe and Wahiawa Watershed, Kauai, June 24, 1895 (Kew); *Heller* (similarly) *2429,* along the Hanapepe River, near the Falls, July 2–8, 1895 (type, Missouri: cotype, U. S.).

A form which might be taken for a distinct species if it were not connected with the species proper by such a complete series of intermediate varieties.

Euphorbia Celastroides var. ο. **niuensis** Sherff, Bot. Gaz. **97**: 598. 1936.

Similar to var. *lorifolia*. Leaf petioles slender, glabrate, 2–3 mm. long; blade oblong, at apex obtuse or rounded, at base oblique-truncate and 3–5 mm. wide, glaucescent, thinnish, ±2.5 cm. long and ±1.2 cm. wide. Capitula ±11 in tiny cymes (these ±1.5 cm. long, the branches spreading or recurved; pedicels slender but short, commonly 1–4 mm. long). Capsules drying dark brown, glabrous, sessile or apparently so, about 2 mm. tall. Seeds grayish over red undercoat, tetragonal, only about 1–1.1 mm. long, only moderately or even indistinctly scrobiculate.

Type: Collected by *Dr. William Hillebrand,* Niu, Oahu (Berlin).

Distribution: Southeastern Oahu.

Specimens examined: *Hillebrand,* Niu, Oahu (type, Berlin).

Perhaps now extinct. The type is a mere fragment but very distinctive. It is the specimen referred to by Hillebrand (Fl. Haw. Isls., p. 395. 1888) for Oahu material of *Euphorbia Celastroides*. I have found no other material to match it.

Euphorbia Celastroides var. π. **amplectens** Sherff, Bot. Gaz. **97**: 598. 1936. (Pl. 8.)

Euphorbia lorifolia Hillebr., Fl. Haw. Isls., p. 395. 1888 (in small part and excluding syns. A. Gray and DC.; *cf.* var. *mauiensis*).

Now a prostrate or erect shrub, now arborescent, much branched; ultimate and penultimate branches grayish-black, puberulous, not strongly ridged, the numerous nodes conspicuous, internodes mostly 1–2 mm. thick. Leaves of various aspects, but mostly with short (1–3 mm.) slender commonly pubescent petiole; blade mostly elliptic-oval to narrowly oblanceolate, at apex truncate and perhaps emarginate to rounded or obtuse, at base rounded or narrowed, with a more or less

brownish tinge to the green when dry, at times puberulous beneath toward petiole, mostly 1.5–3 cm. but sometimes to 6 cm. long. Capitula usually solitary, subsessile; involucre outwardly glabrous or glabrate below, often pubescent to conspicuously tomentose above. Capsule glabrous to moderately puberulous, sessile or apparently so, drying brownish-green to dark brown, about 3 mm. tall. Seeds now definitely tetragonal, now compressed and 2-edged except at the tetragonal truncate base, apically obtuse, grayish (over the red undercoat), scrobiculate, 1.7–2 mm. long.

Type: Collected by *Charles N. Forbes*, no. *355-Mo*, Kaluaaha Valley, Molokai, August, 1912 (Field).

Distribution: Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii.

Specimens examined: *Anon. 375*, shrub about 4–6 ft. tall, Pololu Gulch, Kohala, Hawaii (Field); *Otto Degener 8043*, windswept ridge at beginning of forest, east ridge of Niu Valley, Oahu, April 20, 1931 (Degener; Field; New York); *Degener 8055*, growing 3.5–5 ft. tall, with *Santalum*, Mokomoko Gulch, Molokai, June 7, 1928 (Degener); *Degener 8057*, shrub 3 ft. tall, growing with *Lipochaeta Degeneri* in hot boulder-strewn region not far from ocean, near Kamakaipo, Molokai, May 16, 1928 (Degener); *Degener 8058*, on moderately dry rocky slope, growing with *Exocarpus*, Kahuaawi Gulch, Molokai, May 12, 1928 (Degener; Field; New York); *Degener 8060*, East Ohia ridge, Molokai, July 17, 1928 (Degener; Field; New York); *Degener 8062*, one of the dry valleys between Kamalo and Kaunakakai, Molokai, July 29, 1928 (Degener; Field; New York); *Degener 8070*, Moomomi, Molokai, April 25, 1928 (Degener); *Degener 8076*, dry rocky region, Kaupo Gap, Haleakala, Maui, August 20, 1927 (Degener; New York); *Degener 8077*, northwest of Puu Eke, Maui, August 31, 1927 (Degener, 2 sheets; Field; New York); *Degener 8078*, arid rocky region, Ulupalakua, Maui, June 23, 1927 (Degener, 2 sheets; Field; New York); *Degener 8087*, arid *aa* lava desert, Hoopuloa, Hawaii, August 26, 1926 (Degener, 3 sheets; Field); *Degener 8089*, in tapestry forest, Kohala ditch trail, Kohala, Hawaii, August 10, 1926 (Degener, 3 sheets; Field); *Degener & Kwan Kee Park 8045*, in arid rocky sunny region, second ridge east of Kuliouou Valley, near summit (ridge on west side of Kamehameha Farm School), Oahu, October 25, 1931 (Degener, 2 sheets; Field); *David Douglas 13*, Hawaiian Isls., 1834 (Kew, 2 sheets); *Frederick Eschscholtz*, Oahu, 1816–1817 (Kew; form with leaves closely approaching those in *E. multiformis*); *Abbé Urbain Faurie 471*, on rocks, Yao Valley, Maui, August, 1909 (British; Paris); *Charles N. Forbes 17-Mo*, Kalehu, Molokai, June, 1912 (Bishop); *Forbes 43-L*, mountains near Koele, Lanai, June, 1913 (Field, 2 sheets); *Forbes 93-M*, Iao Valley, West Maui, June, 1910 (Field); *Forbes 255-L*, Limestone Point, Lanai, December 13, 1913 (Bishop); *Forbes 273-M*, beach at Kipahulu, East Maui, July, 1910 (Bishop); *Forbes 314-L*, Lanai, September, 1917 (Field); *Forbes 355-Mo* (type, Field: cotypes, Field; Missouri); *Forbes 358-H*,

Kanahaha, Kona, Hawaii, July 25, 1911 (Bishop); *Forbes 480-M*, Honokohau Drainage Basin, Maui, September 25–October 17, 1917 (Field); *Forbes 533-Mo*, Halawa, Molokai, September, 1912 (Field); *Forbes 1511-O*, Koko Head, Oahu, June 11, 1909 (Bishop); *Forbes 1666-O*, Puu-O-Kona, Oahu, March 14, 1911 (Field); *Forbes 1775-M*, Kaapahu, Maui, December 9, 1919 (Bishop); *Forbes 1877-M*, Nuu, south slope of Haleakala, Maui, March 6, 1920 (Field); *Forbes 1913-M*, same locality, March 9, 1920 (Field); *Forbes 2386-M*, Olowalu Valley, Maui, May 16, 1920 (Field); *Forbes 2529-O*, Wailupe, Oahu, January, 1919 (Bishop); *Charles Gaudichaud*, Hawaiian Isls. (Missouri, fragment *ex herb.* Delessert); *Dr. William Hillebrand*, Molokai, June 21 (Berlin; labeled *Euphorbia lorifolia* by Hillebrand); *Hillebrand 48*, Hawaii (Kew); *Albert S. Hitchcock 14484*, shrub or small tree on lava flow, Puuwaawaa, Hawaii, August 30, 1916 (Bishop; U. S.); *James Macrae*, Maui, May, 1825 (Missouri); fragment *ex herb. Kunthii; Macrae*, Oahu, May 20, 1825 (New York); *Horace Mann & William T. Brigham 101 pro parte*, Oahu, 1864–1865 (Field); *Mann & Brigham 427*, ridge east of Nuuanu Valley, Oahu, 1864–1865 (Bishop); *Maximowitsch 145*, Honolulu, Oahu (Berlin; Kew); *George C. Munro 45*, outer forest, Kaiholena, Lanai, August, 1913 (Bishop); *Munro 97*, Limestone point, Lanai, December 13, 1913 (Bishop); *Munro 705*, alt. about 1000 ft., Ulukolea, Mahana, north side of Lanai, September, 1925 (Bishop); *Munro 828*, alt. 1100 ft., Maunalei Valley, Lanai, August 5, 1930 (Bishop); *Jules Remy 592*, tree, forest of Kekaha, Hawaii, 1851–1855 (Paris); *Joseph F. Rock*, Hawaiian Isls. (Field, 2 sheets); *Rock*, Honokohau Valley, Maui (Bishop); *Rock 8068*, Hawaiian Isls. (Field); *Rock 8126*, Koele, Lanai, August 3, 1910 (Gray); *Rock 8359*, Hawaiian Isls. (Field); *Rock 8677*, East Maui (Field); *Rock 8679*, East Maui (Field); *Rock 17036*, prostrate, near the ocean, Barbers Point, Oahu, November, 1919 (Bishop, 2 sheets; Gray); *Carl Skottsberg 1953*, along road between Lind's and Puuwaawaa, Hawaii, September 26, 1926 (Bishop); *John F. G. Stokes*, Molokai, 1909 (Bishop); *D. LeRoy Topping* (Otto Degener distrib. no.) *8075*, Maui, August 5, 1927 (Degener; Field, 2 sheets; New York, 2 sheets); *Dr. Heinrich Wawra 1852*, Maui, 1868–1871 (Vienna, 2 sheets).

Similar to and apparently passing by many intergradations into the variety *mauiensis*, but with leaves tending to be more often obovate and less often linear, and with seeds commonly larger (1.7–2 mm., not 1.4–1.6 mm. long) and usually tetragonal (only rarely — for example, *Rock 17036* — obcompressed). Plants perhaps not averaging as tall as in variety *mauiensis*, but some of the specimens included here are from plants ±3.6 m. tall (for example, *Forbes 358-H*, "slender, 12 ft., drooping branches").

Apparently includes several forms or races (hence the name *amplectens*).

Euphorbia Celastroides var. ρ. **mauiensis** Sherff, Bot. Gaz. 97: 601. 1936.

Euphorbia lorifolia Hillebr., Fl. Haw. Isls. 395. 1888 (in great part and exclud. syns. A. Gray and DC.; *cf.* var. *amplectens*).[1]

A shrub at lower altitudes to a small tree (3–6 m. tall and with trunk 1.5–2 dm. thick) in the upper regions, the stiff branches puberulous and nodose with short internodes. Leaves with short (1–2 mm.) puberulous petiole; blade linear to linear-oblong or rhombic-linear, apically obtuse to truncate and often retuse, basally somewhat contracted also subtruncate and oblique, glabrous or beneath especially toward base somewhat puberulous, 3–5 (less often to 7 or even to 9.5) cm. long, with a more or less brownish-green color when dry, the lateral veins ventrally dark and distinct. Capitula mostly solitary, sessile or subsessile; involucre outwardly pubescent. Capsule puberulous, subsessile, deeply 3-parted, drying brownish-green to dark brown, ±2.7 mm. tall. Seeds now obcompressed-tetragonal (two of the edges at times reduced to mere median ribs), now distinctly obcompressed and laterally 2-edged except at the tetragonal and truncate base, at apex shallowly rounded, brownish-gray to metallic-brown, scrobiculate, 1.4–1.6 mm. long.

Type: Collected by *Horace Mann & William T. Brigham*, no. *389*, on sandy isthmus of Maui, 1864–1865 (U. S.).

Distribution: Lanai and Maui.

Specimens examined: *Anon.*, Maui (Bishop, fragment *ex* Berlin); *Otto Degener 8074*, barren arid hill, *mauka* of *McGregor*, West Maui, July 10, 1927 (Degener; New York); *Abbé Urbain Faurie 474*, alt. 1500 m., Haleakala, Maui, August, 1909 (Paris); *Charles N. Forbes 115-L*, mountains near Koele, Lanai, June, 1913 (Bishop); *Forbes 139-L*, same locality and date (Field); *Forbes 223-L*, mountains at east end of Lanai, same date (Bishop; Field); *Forbes 366-L*, Kaiholena, Lanai, September, 1917 (Field, 2 sheets); *Forbes 1104-M*, Kaupo Gap, Haleakala Crater, Maui, August 10, 1919 (Field); *Forbes 1811-M*, Kanaio, south slope of Haleakala, Maui, March 2, 1920 (Bishop); *Forbes 1812-M*, same locality and date (Field); *Forbes 2048-M*, Auwahi, south slope of Haleakala, Maui, March 20, 1920 (Field);

[1] Croizat & Degener (*ex* Deg., Fl. Haw. Dec. 9, 1936) give the new combination "*C. lorifolia* (Hillebr.) Croiz. & Deg." and cite "*E. lorifolia* Hilleb., Fl. Haw. Isls. 395. 1888" as their synonym. Of course this treatment is wholly ineffective under the International Rules of Nomenclature, so far as renaming Hillebrand's own plants (my var. *mauiensis*) is concerned. In actual effect, Croizat & Degener have made a new combination, though evidently not meaning to do so, for *Euphorbia multiformis* var. *lorifolia* A. Gray (*qu. vide*, p. 33).

Forbes 2091-M, Auwahi, south slope of Haleakala, Maui, March 24, 1920 (Field); *Forbes & C. Montague Cooke, Jr., 1-M*, Maunahooma, West Maui, May, 1910 (Bishop); *Dr. William Hillebrand 45*, small tree 15–20 ft. tall, Kula, East Maui, July, 1858 (Kew, 2 sheets); *Hillebrand & Rev. J. M. Lydgate*, Hawaiian Isls. (Bishop); *Dr. Albert S. Hitchcock 14809*, alt. 3000–5000 ft., Puu Kukui, West Maui, September 24–26, 1916 (Bishop; U. S.); *Horace Mann & William T. Brigham 389* (type, U. S.: cotypes, Bishop; Cornell; Field; Gray; Missouri); *George C. Munro 66*, Kaiholena, Lanai, August, 1913 (Bishop); *Munro 151*, outer forest, ridge behind Kaiholena, Lanai, September 28, 1913 (Bishop; Field); *Jules Remy 591*, Lanai, 1851–1855 (Paris); *Joseph F. Rock 8073*, Mahana, Lanai, July, 1910 (Field, 2 sheets; Gray; Vienna); *Rock 8560*, gulches above Makawao, Maui, September, 1910 (Field; Gray; New York); *Dr. Heinrich Wawra 2343*, Hawaiian Isls., 1868–1871 (Vienna); *Wawra 2527*, Maui, same date (Vienna); *Gerrit P. Wilder*, Maui, 1913 (Bishop).

As stated under the foregoing variety *amplectens*, that variety apparently passes into this. Because of the peculiarly obcompressed seeds, I had originally held this to be a valid species. The presence of forms of var. *amplectens*, however, in which most of the seeds are distinctly obcompressed (although still of greater length), seems to cast doubt upon the value here, for purposes of *specific* segregation, of the *obcompressed-seed* character. Anyway, the local and visiting botanists who have collected the two forms have very commonly confused them under the (as seen under var. *lorifolia*, erroneous) designation, *Euphorbia lorifolia*.

7. Euphorbia olowaluana Sherff, Bot. Gaz. **97**: 580. 1936.
Chamaesyce olowaluana (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Leaf petiole 1–2 mm. long; blade 1.5–2.5 (rarely –3) cm. long and 4–8 mm. wide; capsule glabrous ..... *E. olowaluana*
Leaf petiole 2–3 mm. long; blade up to 6 cm. long and to 1.4 cm. wide; capsule pubescent ..... var. *β. gracilis*

Shrub or perhaps a small tree, branched; branches brownish-gray (ultimate ones herbaceous, more often very slender, moniliform, glabrate or very minutely hispidulous, their nodes conspicuous). Leaves opposite and distichous, more often divaricate, the slender petiole weakly puberulous and 1–2 mm. long; blade oblongly linear, at apex obtuse or acute, at base oblique (but only about 1–2 mm. wide), membranous, glabrate,

marked underneath with oblique brownish-purple veins, 1.5–2.5 (rarely –3) cm. long and 4–8 mm. wide; stipular body at first triangular. Capitula commonly solitary in axils and also at tips of branchlets. Involucre subsessile, campanulate or urceolate, outwardly glabrate or near summit tomentulose, about 2.3 mm. tall; glands 4, transversely oblong, subcontiguous. Capsule cernuous, conspicuously trigonal, glabrous, brown, about 2.3 mm. tall; cocci weakly carinate, the keel darker; styles connate at base, shortly bifurcate with much-thickened branches; stipe pubescent, manifest. Seeds ovate, tetragonal, brown (at first rarely grayish), scrobiculate, 1.3–1.5 mm. long.

Type: Collected by *Charles N. Forbes,* no. *2341-M,* central ridge of Olowalu Valley, Maui, May 12, 1920 (Bishop).

Distribution: South-central West Maui.

Specimens examined: *Forbes 2242-M,* Olowalu Valley, Maui, May 7, 1920 (Field); *Forbes 2341-M* (type, Bishop).

Euphorbia olowaluana and its variety *gracilis* appear to constitute a species of somewhat questionable integrity, intermediate between *E. multiformis* (as to often acutish leaves) and its variety *microphylla* (as to herbaceous moniliform ultimate branchlets), on the one hand, and its variety *manoana* and *E. Celastroides* varieties *amplectens* and *mauiensis* (as to appearance of leaves, especially of the brownish-purple venation of their lower surface), on the other.

In view of the existence of so many varieties of *E. multiformis* and *E. Celastroides* as are known to occur, the recognition here of *E. olowaluana* and the variety *gracilis* as apart from them must needs be somewhat arbitrary.

Euphorbia olowaluana var. β. **gracilis** (Rock) Sherff, Bot. Gaz. **97**: 581. 1936.

Euphorbia lorifolia var. *gracilis* Rock, Indig. Trees Haw. Isls., p. 259, *pl. 100.* 1913.

Tree, often 6–9 m. tall; stem often 2.5–3 dm. in diameter, covered with a thinnish pinkish bark, this at first smooth but finally often strewn with conspicuous nodular excrescences; branches very slender and drooping, internodes glabrate or

pubescent, nodes usually puberulent. Leaves larger, petiole 2–3 mm. long; blade linear-oblong, up to 6 cm. long and to 1.4 cm. wide. Involucre outwardly hispidulous especially above; capsule pubescent.

Type: Collected by *Joseph F. Rock*, no. 3593, on lava back of Puuwaawaa, North Kona, Hawaii, June, 1909 (Bishop).

Distribution: Hawaii and West Maui.

Specimens examined: *C. J. Austin*, Puuwaawaa, Hawaii, 1912 (Bishop); *Otto Degener 8087*, arid *aa* lava desert, same locality, August 24, 1926 (Degener); *Charles N. Forbes 6-H*, same locality, June 8–14, 1911 (Bishop); *Forbes 463-H*, slopes of Mauna Kea, Waiki, Hawaii, August, 1911 (Bishop); *Forbes & C. Montague Cooke, Jr., 1-M*, Maunahooma, West Maui, May, 1910 (Bishop); *Albert S. Hitchcock 14270*, Koa forest, Kukaiau Ranch, Hawaii, August 20, 1916 (Bishop; U. S.); *Hitchcock 14809*, tree in upper forest, alt. 3000–5000 ft., Puu Kukui, Maui, September 24–26, 1916 (U. S.); *Alfred Meebold*, alt. 5000 ft., Hualalai, Hawaii, May, 1932 (Bishop); *Meebold*, Hualalai, November, 1935 (Field); *George C. Munro*, Puuwaawaa, Hawaii, June 7, 1923 (Field); *Joseph F. Rock*, same locality, August, 1917 (Bishop); *Rock 3593* (cotypes, Bishop; Gray); *Rock 12968*, Puuwaawaa, August, 1917 (Bishop); *Carl Skottsberg 667*, same locality, September 26, 1922 (Bishop).

In addition to the specimens listed may be mentioned two more: *Forbes 874-H*, Omaokoili, Hawaii, June 17, 1915 (Field); *Rock*, Puuwaawaa, Hawaii, August, 1917 (Bishop). These have smaller leaves, as in the species proper, but the capitula are exceedingly numerous. The involucres are mostly of the yellowish-tomentose, brownish- or yellowish-glanded type found in various forms of *E. Celastroides* and in *E. multiformis* var. *manoana*. The Forbes plant has numerous capsules. These, even though ±3.2 mm. tall, are sterile, giving evidence of hybridity.

8. Euphorbia atrococca Heller, Minn. Bot. Studs. 1: 844, *pl. 50*. 1897.

Chamaesyce atrococca (Heller) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Leaves numerous, 5–13 mm. wide, dull green.
  b. Leaf-blade subcoriaceous, 2–4 cm. long, the lateral veins obscure..*E. atrococca*
  b. Leaf-blade thinner, 3–5.3 cm. long, the lateral veins manifest.....
  .....var. *γ. kilaueana*
a. Leaves fewer, the larger ones 1.2–1.8 cm. wide, darker green....var. *β. kokeeana*

Small tree, about 3 m. tall, with brownish bark, freely branching above; secondary branches numerous, with moderately long (often 1–3 cm.) internodes; glabrous ultimate and subultimate branchlets nodose, slender, suggestive of *E. multiformis,* their internodes mostly 0.5–1.5 cm. long. Leaves numerous but not crowded, opposite, the slender petiole glabrous and 3–4 mm. long; blade narrowly to moderately oblong-oblanceolate, at the obtuse to rounded or subtruncate apex sometimes most minutely retuse, at base more often almost or fully equilateral, at margin entire, dull green, subcoriaceous, 2–4 cm. long and 5–13 mm. wide, midvein prominent especially beneath, lateral veins obscure; stipular body broadly triangular, slightly fringed, ±1 mm. tall. Capitula mostly 3–5 in axillary and terminal clusters (these terminating now glabrous sulcate short peduncles now much abbreviated minutely leaved branchlets). Involucre subsessile, campanulate, outwardly glabrate except on lobes, about 2.2 mm. tall; glands 4, transversely oblong, exappendiculate, well separated; stamens exserted. Capsule (submature) oblong-orbicular in side-view, blackish, about 3 mm. tall, commonly erect; cocci carinate, somewhat concave (but not sulcate) on each side of keel, irregularly appressed-hispid with whitish arcuate hairs; styles connate below, bifurcate nearly half-way, the branches apically thickened; stipe glabrate, ±1 mm. long. Seeds said to be "pitted and rugose."

Type: Collected by *Amos Arthur Heller,* no. *2500,* on the ridge west of the Hanapepe River, Kauai, July 4, 1895 (Minnesota).

Distribution: Known only from type locality in southern Kauai.

Specimens examined: *Heller 2500* (cotypes, Field; Gray; New York); *Heller* (similarly) *2500,* on the Hanapepe and Wahiawa Watershed, southern Kauai, July 4, 1895 (Kew); *Heller* (similarly) *2500,* on the ridge west of the Hanapepe River, Kauai, same date (Paris); *Heller* (similarly) *2500,* same locality, July 11, 1895 (Cornell; Field; Gray); *Heller* (similarly) *2500,* same locality, July 17, 1895 (Field); *Heller* (similarly) *2500,* same locality, August 6, 1895 (Field); *Heller* (similarly) *2500,* same locality, August 22, 1895 (Missouri).

Heller describes the seeds as "pitted and rugose" but an examination of some twenty or more of the numerous apparently

full-sized capsules on his various specimens fails to show even one seed. Uniformly the carpels have only tiny white shriveled abortive ovules (although these indeed are, under a high magnification, more or less "pitted and rugose"). Despite the acceptance, apparently without exception, of this species by various botanists who have collected it (or its var. *kokeeana)* in the field (Heller, Rock, Forbes, and Skottsberg), a genetic study of its status with reference to a possibly hybrid origin is much to be desired. (See remark under var. *kokeeana.)*

Euphorbia atrococca var. β. **kokeeana** Sherff, Bot. Gaz. **97**: 603. 1936.

Leaves fewer, broader (the larger ones mostly 1.2–1.8 cm. wide), darker green, the lateral veins evident.

Type: Collected by *Dr. Carl Skottsberg,* no. *1017,* between Kokee and Mohihi, Kauai, October 29, 1922 (Bishop).

Distribution: Southwestern Kauai.

Specimens examined: *Otto Degener 8094,* Waimea Canyon near Kokee Camp, Kauai, June 30, 1926 (Degener, 2 sheets; Field, 2 sheets; New York); *Charles N. Forbes 435-K,* Kaholuamanu, behind Waimea, Kauai, September, 1909 (Field, 2 sheets); *Amos Arthur Heller 2858,* on Kaholuamanu, above Waimea, September 10–16, 1895 (Bishop); *Heller* (similarly) *2858,* same locality, September 24–30, 1895 (Field); *Heller* (similarly) *2858,* same locality, October 1–8, 1895 (Cornell; Gray; Kew; Missouri; New York; Paris; U. S.); *Joseph F. Rock,* Kaholuamanu, Kauai, October, 1911 (Field); *Rock 10099,* below F. Gray's mountain house, Kaholuamanu, same date (Bishop; Gray); *Rock 12933,* Kaholuamanu, same date (Bishop).

On most specimens the apparently mature capsules are, as in the species proper, devoid of good seeds. On two of the cited *Degener* specimens, however, a few ripe seeds were found. These were ovate-oblong in outline, truncate at base, obtuse at apex, acutely tetragonal with prominently carinate angles, reddish-brown to brownish-black, transversely scrobiculate, 1.8–2 mm. long.

Heller (Minn. Bot. Studs. **1**: 844. 1897) described this as "a well marked form, growing at an elevation of 4000 feet, near the edge of the woods."

Euphorbia atrococca var. γ. **kilaueana** Sherff, Bot. Gaz. **97**: 604. 1936.

Differing from the species proper in its more erect (or at least more antrorsely directed) and more elongate branches, also its thinner leaves (which latter are beautifully spatulate-oblanceolate, apically more often somewhat acute, the blade 3–5.3 cm. long). Inflorescence unknown.

Type: Collected by *Abbé Urbain Faurie,* no. *470,* Kilauea, Kauai, January, 1910 (British).

Distribution: Known only from type locality in northeasternmost Kauai.

Specimens examined: *Faurie 470* (type, British: cotype, Paris; cotype fragment, Bishop).

9. Euphorbia multiformis Hooker & Arnott, Bot. Beechey's Voy., p. 95. 1832.

Anisophyllum multiforme Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 37. 1860.

Chamaesyce multiformis (Hook. & Arn.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Branchlets pubescent.
  b. Branchlets, involucres, and pedicels densely tomentulose.
    c. Rameal internodes often only 3–6 mm. long; leaf-blades mostly less than 2 cm. long, their veins very obsolete; capitula clustered in groups of 2–5; stamens exceedingly numerous.....var. *θ. kaalana*
    c. Rameal internodes more elongate; leaf-blades mostly 2–3 cm. long, their veins conspicuous underneath; capitula singly disposed; stamens fewer.....var. *η. tomentella*
  b. Branchlets spreading-hispidulous.
    c. Leaves mostly under 2 cm. long.
      d. Ultimate branchlets capilliform; leaves very thin; plant of East Maui .....var. *γ. haleakalana*
      d. Ultimate branchlets thicker; leaves moderately thin; plant of Oahu .....var. *ι. perdita*
    c. Leaves mostly over 2 cm. long and moderately thin; plant of Oahu, Lanai, and western Hawaii.....var. *ε. manoana*
a. Branchlets glabrous or essentially so.
  b. Dwarf shrub up to 6 dm. tall; capitula few, solitary in upper axils; bog plant of southern Kauai.....var. *ζ. sparsiflora*
  b. Shrub or tree, capitula few or numerous.
    c. Capsular stipe glabrous.....*E. multiformis*
    c. Capsular stipe hispid.
      d. Involucre outwardly glabrous or only slightly pubescent at top.
        e. Ultimate branchlets capilliform or nearly so.....var. *δ. kapuleiensis*

e. Ultimate branchlets slender but hardly subcapilliform.....
.....var. β. *microphylla*
d. Involucre outwardly hirtous, densely tomentose at top....var. ε. *manoana*

A glabrous shrub with slender and even extremely nodose (and often very decompound) branches (ultimate ones 1–1.5 mm. thick for most of their length); internodes of a main branch up to 3.2 cm., of branchlets mostly under 2 cm. long. Leaves opposite, the slender petiole glabrous or obsoletely hispidulous and 1–3 mm. long; blade narrow-oblong or -lanceolate or -oblanceolate, at apex subobtuse, obtuse, or rounded to narrowly truncate and rarely subretuse, entire, moderately and more or less gradually narrowed below to a usually equilateral base, at margin not or scarcely revolute, membranous, obscurely veined above, pale and manifestly veined underneath, 2–3.5 cm. long and 0.9–1.4 cm. wide; stipular body very low (±1 mm. tall), rounded. Capitula solitary, terminal and axillary. Involucre campanulate, outwardly glabrous or (especially above) slightly puberulous, 1.5–1.7 mm. tall; glands 4, broader than tall, transversely oblong to oblong-orbiculate, contiguous or nearly so, exappendiculate; lobes ovate or triangular-ovate and at apex somewhat lacerate-hirsute; pedicel only about 1–2 mm. long. Staminophores numerous, conspicuously exserted. Capsule glabrous, cernuous, short-stipitate, about 3 mm. tall and 3 mm. thick; cocci moderately carinate, brown, not sulcate; stipe glabrous; styles very short, connate at base, bifurcate half-way, the branches not thickened. Seeds ovate, tetragonal, grayish, scrobiculate, about 2 mm. long.

Type: Collected by *Lay* and *Collie* (Captain Beechey's Voyage), Oahu, 1826–27 (Kew).

Distribution: Oahu, exact part unknown; perhaps now extinct.

Specimens examined: Lay & Collie, Oahu, 1826–27 (type, Kew).

Euphorbia multiformis was published as a *nomen nudum* (or *subnudum;* a statement was indeed made regarding the variation in size from a small tree at higher altitudes to a herbaceous plant in low cultivated places) by Gaudichaud (Bot. Freycinet's Voy., p. 100. 1830). It was first effectively published

by Hooker and Arnott *(loc. cit.)*. They gave a definite description and cited Gaudichaud only interrogatively. They drew their description from two specimens by Lay and Collie. These specimens, now before me, are mounted on the same sheet and are still well preserved. They are woody-branched and very leafy. They differ at once from all other specimens of this species known to me in having many of the leaves less rounded or obtuse at the apex (although they are still subobtuse or just barely subacute) and in the entirely glabrous capsular stipe. Perhaps this form is no longer extant upon Oahu, but all other forms at present known are *varietally* quite distinct and for a proper understanding of their relationships should be so designated.

The *Gaudichaud* material, as indeed the *Eschscholtz*, the *Maximovicz* (or *Maximowitsch)*, and the *Macrae* materials cited by Boissier *(in* DC., Prodr. **15**, pt. 2: 12. 1862) for *E. multiformis*, is referable to variety *manoana*. An additional specimen (Vienna) collected by Lay and Collie on Oahu and distributed from Banks' herbarium as *Phyllanthus distichus*, likewise belongs to the variety *manoana*. Still another specimen collected by Lay and Collie and mounted on the same sheet (Kew) with the type of *E. Hookeri* belongs to the variety *microphylla*. Whether this last specimen had been so mounted prior to Hooker and Arnott's preparation of their description I cannot say, but their respective descriptions of *E. multiformis* and of the plant later named by Steudel *E. Hookeri* clearly do not pertain to it and it thus is to be excluded from our concept of *E. multiformis* proper.

Euphorbia multiformis var. β. **microphylla** Boissier *in* DC., Prodr. **15**, pt. 2: 12. 1862.

Euphorbia multiformis Gaudichaud, Bot. Freycinet's Voy., p. 100. 1830 (in part; *nomen subnudum)*.

Euphorbia multiformis var. *tenuior* A. Gray *ex* H. Mann, Proc. Amer. Acad. **7**: 202 (Enum. Haw. Pl., no. 439, var. γ.). 1867.

Euphorbia multiformis var. α. A. Gray *ex* Hillebr., Fl. Haw. Isls., p. 396. 1888.

Mainly glabrous; lateral branches or branchlets slender and usually more elongate (often almost subcapilliform), more or less herbaceous. Leaf petiole often pubescent; blade from elliptic-oblong to cuneately obovate, at apex mostly rounded and more often retuse; very diverse in size, now 2–4.5 cm. now for many branchlets down to 0.5 cm. long. Involucre outwardly glabrous or sometimes slightly pubescent at top; capsule glabrous, its stipe hispid.

Type: Collected by *Jules Remy*, no. *593*, Oahu, 1851–55 (Paris).

Distribution: Oahu and northeastern Molokai.

Specimens examined: *Frederick Debell Bennett 121*, Oahu (Berlin); *Otto Degener & Kwan Kee Park 8040*, rocky moderately wet sunny ridge, Pig God Trail, Punaluu Valley, Oahu, August 11, 1931 (Degener, 2 sheets; Field); *Degener & Kazuto Nitta 8052*, talus, in rainy region not far from ocean, Wailau Valley, Molokai, August 4, 1928 (Degener, 2 sheets; Field; New York); *Degener 8063*, rocky and partly wooded ridge, east rim of Manoa Valley, Oahu, February 28, 1928 (Degener, 2 sheets; Field; New York); *Degener 8072*, rocky region, Hauula Valley, Oahu, September 25, 1927 (Degener; Field; New York); *Degener 8079*, Oahu, February 20, 1927 (Degener; New York); *Degener 8081*, head of Manoa Valley, Oahu, January 9, 1927 (Degener, 2 sheets; Field; New York); *Degener 8082*, moderately wet open region, slope northeast of Nuuanu Valley, Oahu, November 20, 1926 (Degener, 2 sheets; New York); *Degener 8084*, along trail near hairpin turn at Nuuanu Pali, Oahu, November 20, 1926 (Degener); *Degener 8096*, open rocky moderately rainy ridge, northeast of Nuuanu Pali, Oahu, March 28, 1926 (Field; New York); *Degener, K. Park & D. L. Topping 9966*, in rainy forest near summit, Kuliouou Valley, Oahu, June 23, 1935 (Berlin; British; Degener; Delessert; Field; Gray; Kew; Leningrad; Missouri; Paris); *Degener & Park 9967*, edge of forest with *Dicranopteris*, east ridge of Kaipapau Valley, Oahu, July 7, 1935 (Berlin; Degener; Field; Paris); *Abbé Urbain Faurie 469*, Kalihi Pali, Oahu, October, 1909 (Delessert); *Charles N. Forbes*, Upper Kalihi, Oahu, April 2, 1909 (Bishop); *Forbes*, Koolauloa Mountains between Punaluu and Kaipapau, Oahu, November 14–21, 1908 (Field); *Forbes 248-Mo*, Pelekunu Trail, Molokai, July, 1912 (Field, 2 sheets; Missouri); *Forbes 545-Mo*, Wailau Valley, Molokai, September, 1912 (Bishop; Field; Missouri); *Forbes 1048-O*, ridge west of Nuuanu Valley, Oahu, January 20, 1909 (Field); *Forbes 1257-O*, Kalihi Valley, April 2, 1909 (Field, 2 sheets); *Forbes 1427-O*, west side of Nuuanu Valley, Oahu, December 17, 1909 (Field, 2 sheets; Missouri); *Forbes 1668-O*, ridges of Puu-O-Kona, Oahu, March 14, 1911 (Field); *Forbes 2009-O*, ridge east of Kouliouiki, Oahu, November 17, 1914 (Bishop; Missouri); *Charles Gaudichaud*, Hawaiian Isls. (Paris); *Gaudichaud*, Hawaiian Isls., September–October, 1836 (Paris, 2 sheets); *Amos Arthur Heller 2199*, lower slopes of Konahuanui, above Manoa, April 22, 1895 (Missouri; New York; U. S.); *Heller* (similarly) *2199*, at the Pali, Oahu, April 23, 1895 (Cornell; Field, 3 sheets; Gray; Kew; Paris); *Heller* (similarly) *2199*, same place, May 24, 1895 (Bishop; Delessert; Field); *Dr. William Hillebrand*, Oahu (Berlin);

Hillebrand, Nuuanu, Oahu (Kew); *Hillebrand 49*, Oahu (Gray; Kew); *Hillebrand & Rev. John M. Lydgate*, ridge, Hawaiian Isls., May, 1872 (Bishop; the plant may have been collected by Lydgate alone, or else in an earlier year, since Hillebrand himself is said to have left the Hawaiian Islands in 1871—*cf.* W. F. Hillebrand in Hillebr. Fl. Haw. Isls., p. xii, 1888); *Hillebrand & Lydgate, Palolo*, Oahu (Bishop); *Hinds*, Hawaiian Isls. (Kew); *Albert S. Hitchcock 13766*, grassy slope, Nuuanu Pali, Oahu, June 17, 1916 (Bishop; U. S.); *Hitchcock 14058*, same place, July 19, 1916 (U. S.); *Lay & Collie* (Capt. Beechey's Voy.), Oahu (Kew, where mixed with *Euphorbia Hookeri*); *H. L. Lyon 12934*, Niu Ridge, Oahu, August 29, 1909 (Bishop); *James Macrae*, Oahu, May, 1825 (Kew); *Horace Mann & William T. Brigham 101 pro parte*, Oahu, 1864–1865 (Field; Gray; Missouri; New York); *Mann & Brigham 244*, Hawaiian Isls., 1864–1865 (Bishop; Cornell); *Alfred Meebold*, alt. 2500 ft., Punaluu, Oahu, May, 1932 (Bishop); *Dr. Meyen*, Oahu (Missouri); *Thomas Nuttall*, Oahu, 1835 (Kew); *E. Onauye*, small tree about 12 ft. tall, rain forest, alt. 1700 ft., Maakua-Papali ridge, Kaipapau Forest Reserve, Hauula, Koolau Mountains, Oahu, October 15, 1933 (New York); *Remy 593* (type, Paris); *Joseph F. Rock 3038*, Niu Valley, Oahu, December, 1910 (Gray; New York); *Rock 4822*, alt. 1200 ft., same locality, August 22, 1909 (Bishop; Gray; Vienna); *Rock 17068*, Palolo-Manoa Valley, Oahu, May, 1918 (Bishop); *Rock 17327*, dry section of Waiahole, Oahu, December, 1919 (Bishop); *Rock 17328*, wet forest, along trail at Waiahole, Oahu, December, 1919 (Bishop); *Rock & O. Sweezy*, Niu Valley, Oahu, December, 1910 (Field); *Harold St. John 10090*, bush 5 ft. tall, open woods, alt. 2100 ft., Kaluanui, Oahu, November 30, 1929 (Field); *Dr. Berthold Seemann 1728*, Oahu, May, 1849 (Gray; Kew); *John F. G. Stokes*, Kanapou Bay, Kahoolawe (Bishop); *United States Exploring Expedition*, Oahu, 1840 (U. S); *U. S. Explor. Exped.*, barren hills behind Honolulu, Oahu, 1840 (Gray); *Dr. Heinrich Wawra* 1754, Oahu, 1868–71 (Vienna, 2 sheets); *Wawra 2341*, Hawaiian Isls., 1868–71 (Vienna).

At times the plants are more sarmentose, the numerous additional delicate branchlets having an abundance of smaller leaves and bearing capsules down to 1.6 mm. long with seeds about 1.4 mm. long.

Euphorbia multiformis var. γ. **haleakalana** Sherff, Bot. Gaz. 97: 591. 1936.

In habit very similar to variety *microphylla*. Branches and leaf petioles hispid. Involucre outwardly now glabrate now (especially toward summit) spreading-hispid; glands more often spreading; pedicel densely and spreadingly white-hispid. Capsule about 1.5 mm. tall, its stipe spreading-hispid.

Type: Collected by *Charles N. Forbes*, no. *2010-M*, Auwahi, southernmost East Maui, March 18, 1920 (Field).

Distribution: Known only from type locality in East Maui.

Specimens examined: *Forbes 2010-M* (type, Field).

Euphorbia multiformis var. δ. **kapuleiensis** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 591. 1936.

Similar to variety *microphylla*. Shrub about 1.8 m. tall, very delicate, branches elongate and almost pendulous; ultimate branchlets subcapilliform or capilliform; internodes commonly more elongate; leaves commonly linear-oblong or narrowly elliptic, petiole 2–3.5 mm. long, blade less than 3 cm. long.

Type: Collected by *Otto Degener*, no. *8053*, 6 ft. tall, with long almost drooping branches, rare, up ridge called Kapulei to east of white mountain Kaholoapele and back in east gully, growing on arid cliff near mango trees in east gully, Molokai, June 25, 1928 (Delessert).

Distribution: Southeastern Molokai.

Specimens examined: *Degener 8053* (type, Delessert: cotypes, Degener; Field; New York); *Degener 8056*, on arid cliffs, second eastern gulch, Wawaia, Molokai, June 27, 1928 (Degener, 3 sheets; Field); *Degener 8061*, one of the dry valleys between Kamalo and Kaunakakai, Molokai, July 29, 1928 (Degener, 2 sheets; Delessert; Field, 2 sheets).

Euphorbia multiformis var. ε. **manoana** Sherff, Bot. Gaz. **97**: 591. 1936.

Euphorbia multiformis Gaudichaud, Bot. Freycinet's Voy., p. 100. 1830 (in part; *nomen subnudum);* Boiss. *in* DC., Prodr. **15**, pt. 2: 11. 1862 (from the description and synonym of Gaudichaud [in part] and from the plants of Eschscholtz, of Maximovicz, and of Macrae; excluding syn. Hook. & Arn.).

Younger branches glabrous (as on type) or spreading-hispidulous. Leaves more often elliptic-oblong to cuneately oblanceolate, at apex mostly rounded or truncate-rounded and often retuse, sometimes hispidulous underneath and often with tomentulose petiole. Involucre outwardly papillate-hirtous below and densely tomentose at top.

Type: Collected by *Carl Johann Maximovicz (Maximowitsch)*, no. *145*, Honolulu, Oahu (Kew).

Distribution: Oahu, Lanai, and western Hawaii.

Specimens examined: *Mr. Ballieu*, Hawaiian Isls. (Paris); *Otto Degener H-213*, on Tantalus side of Manoa Valley, Oahu, February 12, 1923 (Degener, 2 sheets; Field; New York, 2 sheets); *Frederick Eschscholtz*, Oahu, 1816–17 (Delessert;

Gray; Kew); *Charles N. Forbes*, ridge west of Kalihi Valley, Oahu, August 18, 1908 (Field, 2 sheets; Missouri); *Forbes 358-H*, growing 12 ft. tall, with drooping branches, Kanehaha, Kona, Hawaii, July 25, 1911 (Bishop); *Forbes 1660-O*, Pacific Heights ridges, Oahu, March, 1911 (Field, 2 sheets); *Forbes 1838-O* and *1842-O*, Waianae Mountains, Kawaihapai, Oahu, February 14, 1913 (Field; apparently a second growth form, the larger leaves with blades up to 7.6 cm. long and 2.7 cm. wide); *Charles Gaudichaud*, Hawaiian Isls., 1819 (Berlin); *Dr. William Hillebrand*, Honolulu, Oahu (Vienna); *Lay & Collie* (Capt. Beechey's Voy.), Oahu, 1826–27 (Vienna); *James Macrae*, Oahu, May 20, 1825 (Berlin; New York; Vienna); *Maximowicz 145* (type, Kew: cotype, Berlin); *George C. Munro 69*, Maluea, Lanai, December 27, 1913 (Bishop); *Munro 80*, same locality and date (Bishop, 2 sheets); *Joseph F. Rock*, right-hand branch of Wailupe Valley, Oahu, April 14, 1918 (Bishop); *Rock 8126*, Koele, Lanai, August 3, 1910 (Field); *Carl Skottsberg 1073*, Nuuanu-Pauoa ridge, Oahu, November 5, 1922 (Bishop); *United States Exploring Expedition*, Oahu, 1840 (Missouri; U. S.); *Adelbert Von Chamisso 182*, Oahu, 1816–17 (Berlin; Leningrad).

Boissier, to whom this variety represented the species proper, described the plants as glabrous. In two of the collections cited by him (Eschscholtz's and Macrae's), however, the younger branchlets and leaf petioles and lower surfaces are more or less hispidulous; so also for some of Gaudichaud's original material, namely, Kunth's ample fragment (Berlin). The difference in pubescence seems hardly constant enough to justify attempts at further delimitation.

Perhaps hybridizes with *E. Celastroides (qu. vide)* or one of its varieties.

Euphorbia multiformis var. ζ. **sparsiflora** (Heller) Sherff, Bot. Gaz. **97**: 590. 1936.

Euphorbia sparsiflora Heller, Minn. Bot. Studs. **1**: 846, *pl. 51*. 1897.

Euphorbia palustris Heller, *loc. cit.* 847.

A glabrous shrub, 2.5–6 dm. tall, stems slender, branched, the branches ascending. Leaves oblong-oblanceolate to obovate, evenly narrowed to a cuneate base, rounded and blunt at the apex, blade 1.5–2.8 cm. long. Capitula few, solitary in the upper axils.

Type: Collected by *Amos Arthur Heller*, no. *2699*, at altitude of 3000 feet, in bog at head of the Wahiawa River, Kauai, 1895 (Minnesota).

Distribution: Southern Kauai.

Specimens examined: *Abbé Urbain Faurie 467*, Hanapepe, Kauai, December, 1909 (British; Paris); *Charles N. Forbes 206-K*, Wahiawa Swamp, Kauai, August, 1909 (Field, 2 sheets); *Heller 2699*, in and near a bog at the head of the Wahiawa River, Kauai, August 12, 1895 (Bishop, 2 sheets; Field, 2 sheets; Gray; Missouri; New York); *Heller* (similarly) *2699*, same locality, August 21, 1895 (Paris); *Heller* (similarly) *2699*, same locality, October 19, 1895 (Cornell; Field, 2 sheets); *Rev. J. M. Lydgate*, Wahiawa Mountains, Kauai (Bishop).

In herbarium specimens the stems are apt to be covered with moss and other swamp vegetation. Faurie gives merely "Hanapepe" for his locality, but the conspicuous investment of bog moss around the lower stem of one of his specimens betrays a bog habitat.

Euphorbia multiformis var. η. **tomentella Boissier** *in* DC., Prodr. 15, pt. 2: 12. 1862. (Pl. 9.)

The numerous branchlets tomentulose to tomentose. Leaves resembling those of var. *manoana*, petiole 2–3 mm. long and densely tomentose; blade with conspicuous veins on lower surface (which is more or less tomentulose, especially toward petiole), up to 3.2 cm. long. Capitula singly disposed at the nodes, conspicuously tomentose, about 3 mm. across, the glabrate to sparsely pilose glands brownish-black; staminophores not numerous. Capsules not known.

Type: Collected by *Jules Remy*, no. *594*, Oahu, 1851–1855 (Paris).

Distribution: Oahu.

Specimens examined: *Remy 594* (type, Paris).

Euphorbia multiformis var. θ. **kaalana** Sherff, Bot. Gaz. 97: 590. 1936.

Branchlets slender but conspicuously nodose, tomentulose, the numerous internodes often only 3–6 mm. long. Leaf petioles tomentulose, about 1–1.5 mm. long; blade more or less obovate, membranaceous, basally oblique, apically rotundate and often even retuse, silvery-tomentulose underneath, less than 2 cm. long, the veins very obsolete. Capitula rather numerous, often clustered in groups of 2–5 at the tips of very minute axillary branchlets, conspicuously tomentose, about 3 mm. wide; glands brown, more or less glabrate; anthers ex-

ceedingly numerous. Capsules minutely pilose, about 2.5 mm. tall and about 3 mm. wide. Seeds subtetragonal, scrobiculate, 1.5 mm. long.

Type: Collected by the *United States Exploring Expedition*, Waianae, western Oahu, 1840 (U. S.).

Distribution: Known only from type locality in western Oahu.

Specimens examined: *U. S. Explor. Exped.*, Waianae, Oahu, 1840 (type, U. S.: cotype fragments, Bishop; Gray; Missouri).

A transitional form which might almost as well be considered a variety of *E. Celastroides* Boissier. It was confused by Asa Gray with *E. multiformis* var. *tomentella* Boiss., a plant with leaf blades mostly 2–3 cm. long, their veins conspicuous underneath, internodes of branchlets more elongate, capitula singly disposed, stamens fewer, etc.

Euphorbia multiformis var. i. **perdita.**

Varietas nova. Ramuli tenues suberecti, moderate nodosi internodiis saepius 8–15 mm. longis, aegre brevissimeque patenti-hispidi, saepius circ. 1 mm. crassi. Folia principalia anguste oblonga, apice truncata vel emarginata basi inaequilateralia (lamina ±1.8 cm. longa et 6.5 mm. lata, petiolo ±2 mm. longo); ramulorum parva et sub 1 cm. longa, oblongo-obovata, apice truncata vel emarginata, basi truncata vel parce subcordata, membranacea, petiolo tenui ±1 mm. longo marginibusque pubescentia aliter glabrata, venis obsoletis. Capitula numerosa, plerumque in ramulis minutis axillaribus 2–5-adgregata, albido-tomentulosa, circ. 3 mm. crassa, glandulis siccis brunneis glabratis; antheris numerosis; capsula plus minusve albo-pubescenti, subsessili; seminibus subtetragonis, scrobiculatis, circ. 1.4 mm. longis.

Branchlets slender, suberect, moderately nodose (internodes more often 8–15 mm. long), weakly and very shortly spreading-hispid, more often about 1 mm. thick. Principal leaves narrowly oblong, apically truncate or emarginate and basally oblique (blade ±1.8 cm. long and 6.5 mm. wide, petiole ±2 mm. long); leaves of the branchlets small and under 1 cm.

long, oblong-obovate, apically truncate or emarginate, basally truncate or scarcely subcordate, membranaceous, petiole (slender and ±1 mm. long) and margins pubescent but surfaces glabrate, veins obsolete. Capitula numerous, commonly 2–5-clustered on minute axillary branchlets, whitish-tomentulose, about 3 mm. thick, the glabrate glands brown when dry; anthers numerous; capsule more or less white-pubescent, subsessile; seeds subtetragonal, scrobiculate, about 1.4 mm. long.

Type: Collected by *Adelbert Von Chamisso*, island of Oahu, 1816–1817 (Field).

Distribution: Oahu.

Specimens examined: *Von Chamisso*, Oahu, 1816–1817 (Field, type).

10. Euphorbia Skottsbergii Sherff, Bot. Gaz. **97**: 588. 1936. *Chamaesyce Skottsbergii* (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Principal leaves entire or seldom very obscurely denticulate near apex; plants of southwestern Oahu.
  b. Prostrate, ultimate branchlets slender but not capilliform....*E. Skottsbergii*
  b. Erect, ultimate branchlets capilliform.....var. *β. kalaeloona*
a. Principal leaves often denticulate; plants of northwesternmost Molokai.
  b. Leaves commonly elliptic or narrowly obovate-elliptic....var. *δ. Vaccinioides*
  b. Leaves elliptic-oblong to suborbicular.....var. *γ. audens*

Prostrate shrub, ramose; branches slender (ultimate ones exceedingly so), nodose, divaricate, the youngest ones tomentulose. Leaf petioles slender, tomentulose, 1–3 mm. long; blade variously obovate-oblong, oblong-elliptic, or obovate-subrhombic, basally often obliquely cuneate-rotundate, apically obtuse or rotundate, at the scarcely subrevolute margin flat or subrepand (toward apex very rarely obsolete-denticulate), membranaceous, glabrate above, more or less hispidulous below, commonly 1–2 cm. long and 7–13 mm. wide; interpetiolar body scarcely 0.5 mm. tall. Capitula commonly disposed along very minute axillary branchlets. Involucre not truly pedicellate, minute, campanulate, glabrate or moderately hispidulous, only about 1–1.1 mm. tall; glands 4 or more rarely 5, transversely oblong, exappendiculate, remote or almost contiguous; lobes minute, erectly oblong, fimbriate; staminophores ex-

serted. Capsule minute, glabrate, only about 1.6 mm. tall, cernuous, stipitate, short-hispidulous; cocci scarcely carinate, not sulcate; styles distinct, bifurcate almost to the middle. Seeds ovate, tetragonal, basally truncate, apically obtuse, cinereous, papillate-scrobiculate, about 1.1 mm. long.

Type: Collected by *Dr. Carl Skottsberg,* no. *122,* Ewa coral flat, Oahu, August 11, 1922 (Bishop).

Distribution: Near southern coast of Oahu, from Barbers Point eastward toward Pearl Harbor.

Specimens examined: *Otto Degener 8050,* arid fossil reef, between Barbers Point and Pearl Harbor, Oahu, May 8, 1932 (Degener; Field; New York); *Charles N. Forbes 2330-O,* coral plain below Ewa and Sisal, Oahu, March 14, 1916 (Field, 4 sheets); *Skottsberg 122* (type, Bishop); *Otto H. Swezey,* Oahu (Bishop).

To be distinguished from the somewhat similar *E. multiformis* var. *kaalana,* with which it has been confused in herbaria, by its smaller and less tomentulose involucres, its much smaller capsules, etc.

Euphorbia Skottsbergii var. β. **kalaeloana** Sherff, Bot. Gaz. **97**: 589. 1936. (Pl. 10.)

Erect, more branched; ultimate branchlets more often capilliform. Leaves smaller, more often 5–9 (rarely –14) mm. long.

Type: Collected by *Joseph F. Rock,* no. *17034,* coral plain, under algaroba, back of Barbers Point, Oahu, November, 1919 (1st sheet, Gray; 2nd sheet, Bishop).

Distribution: Known only from type vicinity of Barbers Point (Kalaeloa), southern coast of Oahu.

Specimens examined: *Charles N. Forbes* (with C. Montague Cooke, Jr.) *1760-O,* near Sisal, Oahu, February 12, 1912 (Field); *Rock 17034* (1st type sheet, Gray; 2nd type sheet, Bishop).

Euphorbia Skottsbergii var. γ. **audens** Sherff, Bot. Gaz. **97**: 589. 1936.

Leaf-blade rotundate or more often oblong or elliptic-oblong, at the often emarginate apex obtuse or subtruncate, at the often oblique base narrowed or truncate or more rarely somewhat subcordate, on each edge cartilaginous and commonly (but not always) 3–10-denticulate with the sharp and indurated teeth

subspreading-antrorse; stipular body triangular (very widely so), finally often cleft, scarcely 1 mm. tall. Involucral glands commonly 5 more rarely 4, yellow (or when dry blackish-brown), commonly contiguous. Capsule sparsely pilose at base; seeds about 1.3 mm. long.

Type: Collected by *Charles N. Forbes,* no. *620-Mo,* beach near Ka Lae Ka Ilio Ilio, Molokai, March 25, 1915 (Missouri).

Distribution: Near coast, northwesternmost Molokai.

Specimens examined: *Otto Degener 8066,* on arid coastal chiefly basic rocks, near Pohahumauliuli, Molokai, April 28, 1928 (Degener, 2 sheets; New York); *Degener 8068,* arid region near the coast, near Waiakanapo, Molokai, April 19, 1928 (Degener, 2 sheets; Field; New York); *Degener 8071,* on aeolian lime deposits in arid region, near Moomomi, Molokai, April 25, 1928 (Degener, 2 sheets; Field; New York); *Forbes 620-Mo* (type, Missouri).

Euphorbia Skottsbergii var. δ. **Vaccinioides** Sherff, Bot. Gaz. **97**: 589. 1936.

Leaves commonly elliptic or narrowly obovate-elliptic, on each edge often 1–12-denticulate.

Type: Collected by *Joseph F. Rock,* no. *14072,* west end flats, Molokai, April, 1918 (Bishop).

Distribution: Western Molokai.

Specimens examined: *Otto Degener 8065,* on small limestone *kipuka* in sand dunes southeast of Moomomi, Molokai, April 29, 1928 (Degener); *Joseph F. Rock 14029, Hawaiian Isls.* (Bishop); *Rock 14072* (type, Bishop).

11. Euphorbia Hillebrandii Léveillé *in* Fedde, Repert. **10**: 151. 1911.

Chamaesyce Hillebrandii (Lévl.) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

a. Capitula usually solitary or subsolitary.
  b. Larger leaves commonly 4–6 cm. long and 1.5–2 (or even to 3.3) cm. wide ..... *E. Hillebrandii*
  b. Larger leaves commonly under 4 cm. long and under 1.5 cm. wide..... ..... var. γ. *waimanoana*
a. Capitula in a much contracted 3–10-cephalous inflorescence.....var. β. *palikeana*

Shrub probably 1–2 m. tall, glabrous, stems moderately nodose, branches slender and somewhat herbaceous. Leaves opposite and distichous, the slender and more or less hispidulous petiole 1–4 mm. long; blade narrowly or sometimes

broadly oblong-elliptic, narrowed to rounded or rarely somewhat subcordate at the often oblique base, more or less gradually narrowed above middle to a subacute or acute (or more rarely subacuminate) apex, very entire, slightly revolute, 2–6 cm. long and 1.2–2 (rarely –3.3) cm. wide; stipular body a mere ridge 1–1.5 mm. tall. Inflorescence much as in *E. Hookeri* var. *integrifolia,* the capitula usually solitary (very rarely 3-5). Capsule trigonous, glabrous, about 2.2 mm. tall but nearly 3 mm. thick; cocci moderately carinate, not sulcate; stipe now glabrous or glabrate now pubescent; styles connate at base, bifurcate half-way into apically somewhat thickened branches. Seeds much as in *E. Hookeri,* about 1.1 mm. long.

Type: Collected by *Abbé Urbain Faurie,* no. *468,* Kaala, Oahu, December, 1909 (herbarium not cited but perhaps Paris).

Distribution: Northern and central Oahu; northwesternmost Maui.

Specimens examined: *Anon. 160,* shrub about 4 ft. tall, alt. 2500–3000 ft., east side trail, Puu Kaala, Oahu, July 22, 1928 (Field); *H. F. Bergman,* alt. 1700 ft., moist woods, east side of ridge on trail to Puu Kaala, Oahu, February 11, 1928 (Bishop; Field); *J. C. Bridwell,* Puu Kaala, Oahu, January, 1920 (Bishop); *Edwin H. Bryan, Jr., Amy Suehiro & M. Fukuda,* alt. 1200–1400 ft., zone 2, south ridge of Kipapa Gulch, Waipio, Koolau Mountains, Oahu, May 15, 1932 (Bishop); *Otto Degener 8048,* moderately dry open woods, below Palikea on Honolulu side, Oahu, October 23, 1932 (Degener; Field; New York); *Degener 8080,* dry shaded ridge, near Mauna Kapu, Waianae Mts., Oahu, January 15, 1927 (Degener, 2 sheets; Field; New York); *Degener & Kwan Kee Park 8044,* becoming 5 ft. tall, open forest, Kanehoa, Oahu, July 5, 1931 (Degener; Field; New York); *Degener, Park & Y. Nitta 8046,* in woods, Pupukea-Kahuku region, Oahu, May 28, 1932 (Degener; Field; New York); *Degener, Park & Nitta 8047,* same locality and date (Degener; New York); *Degener, Park, Potter, Bush & Topping 9963,* at edge of forest, Waimano, Oahu, June 9, 1935 (Berlin; Degener; Delessert; Field; Gray; Kew; Missouri; New York; Paris; Vienna); *Degener, Park, Potter, Bush & Topping 9975,* open rainy woods, Malaekahana Trail, Laie, Oahu, July 29, 1935 (Degener; Field; Kew; Paris; Vienna); *Degener, Park, Shigeura & Takamoto 10114,* sunny exposed ridge, between Palehua and Palikea, Oahu, December 16, 1935 (Berlin; British; Cornell; Degener; Delessert; Field; Gray; Kew; Missouri; New York; Paris; Philadelphia; U. S.; Vienna); *Degener & C. L. Shear 8059,* on *Dicranopteris*-covered partly wooded ridge, Waipio-Waiawa Ridge, Oahu, March 5, 1928 (Degener; Field, 2 sheets; New York); *Faurie 468* (cotypes, British; Paris); *Charles N. Forbes,* Koolaulon Mountains between Punaluu and Kaipapau, Oahu, December 14–21, 1908 (Bishop); *Forbes,* Makaha Valley, "Kaala Moun-

tains" (Waianae Mountains), Oahu, February 12–19, 1909 (Bishop); *Forbes 352-M*, Honokohau Drainage Basin, Maui, September 25–October 17, 1917 (Bishop); *Forbes 1159-O*, "Kaala Mountains" (Waianae Mountains), February 12–19, 1909 (Field; Missouri); *Forbes 1679-O*, Palehua, Waianae Mountains, Oahu, April 1–4, 1911 (Field, 2 sheets; Missouri); *Forbes 1770-O pro parte*, Mokuleia, slopes of Puu Kaala, Oahu, April 26–May 16, 1912 (Field); *Forbes 2042-O*, ridge north of Waimea Valley, Oahu, February 10–13, 1915 (Bishop); *Forbes 2104-O*, Kawailoa, Oahu, March 2–5, 1915 (Bishop; Missouri); *Dr. William Hillebrand*, Waiawa, Oahu (Bishop); *E. P. Hume 81*, alt. 400 m., valley bottom, Kipapa, Oahu, February 15, 1931 (Bishop); *E. Lyman*, damp forest, south ridge, Kipapa Gulch, Koolau Mountains, Oahu, November 10, 1929 (Bishop); *A. Meebold*, alt. 1500 ft., Pupukea, Oahu, May, 1932 (Bishop); *Joseph F. Rock 17030*, Mokuleia-Makaleha, Oahu, April, 1918 (Bishop); *Carl Skottsberg 220*, ditch trail, Oahu, August 15, 1922 (Bishop); *Skottsberg 269*, Palehua, Waianae, Oahu, August 23, 1922 (Bishop); *Skottsberg 366-b*, north slope of Puu Kaala, Waianae, Oahu, August 30, 1922 (Gothenburg).

Apparently hybridizes with varieties of *E. Celastroides (qu. vide)*.

Euphorbia Hillebrandii var. β. **palikeana** Degener & Sherff *ex* Sherff, Bot. Gaz. **97**: 581. 1936.

Inflorescence 3–10-cephalous, much contracted, 0.5–1.5 cm. long, the bracteolate nodules numerous and conspicuous.

Type: Collected by *Otto Degener, Kwan Kee Park, and William Bush*, no. *8049*, open woods, in third small valley northeast of Palikea, Oahu, September 19, 1932 (N. Y.).

Distribution: Known only from type locality in southwestern Oahu.

Specimens examined: *Degener, Park & Bush 8049* (type, New York: cotype, Degener); *McDaniels (Dr. Carl Skottsberg* distrib. no.) *2091*, Wahiawa-Waipio ridge, Koolau, Oahu, October 6, 1922 (Gothenburg).

Perhaps a mere state of the species proper.

Euphorbia Hillebrandii var. γ. **waimanoana** Sherff, Bot. Gaz. **97**: 581. 1936.

Chamaesyce Hillebrandii var. *waimanoana* (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Branches ascending, virgate, sulculate, glabrous, moderately nodose, internodes more often 1.3–3 cm. long. Leaf petioles slender, spreading-hispidulous, 1–2 mm. long; blades elliptic-lanceolate or (often subrhomboidally) oblanceolate-oblong, at

apex subacute or acute and almost mucronate, at base oblique and narrowed or subtruncate, glabrous, membranaceous, at margin scarcely subrevolute, somewhat paler underneath, 2–4 cm. long and 7–15 mm. wide; interpetiolar bodies widely triangular, ±0.5 mm. tall. Capitula axillary and terminal (sometimes upon minute subcapilliform axillary branchlets), solitary or subsolitary. Involucre campanulate, minute (under 1.5 mm. tall), outwardly glabrate; lobes hirtous; glands 5, transversely oblong, more or less contiguous, exappendiculate; stamens exserted; pedicel glabrous, less than 1 mm. long. Capsule (submature) glabrous, scarcely 2 mm. tall, cocci moderately carinate and esulculate; stipe glabrous, ±4 mm. long; styles distinct, bifurcate almost to the middle; seeds not seen.

Type: Collected by *Charles N. Forbes* (with *Dean Lake),* no. *1978-O,* Waimano Ridge, Oahu, October 27–30, 1914 (Bishop).

Specimens examined: *Forbes 1978-O* (type, Bishop).

Perhaps to be regarded as specifically distinct, therefore described rather fully here. The varietal name was unfortunately misspelled in the original description, to read *wainianana.*

12. **Euphorbia Hookeri** Steudel, Nomencl. ed. 2, **1**: 612. 1840; Boissier, Icon. Euphorb., *tab. 3.* 1866.

Euphorbia myrtifolia Hook. & Arn., Bot. Beechey's Voy., p. 95. 1832 (not L.).

Anisophyllum virgatum Klotzsch & Garcke *in* Klotzsch, Linn. natürl. Pflanzenkl. Tricoccae Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 36. 1860.

Euphorbia coriariaefolia Boiss. *in* DC., Prodr. **15**, pt. 2: 12. 1862.

Euphorbia Arnottiana Endlich., Fl. Suds. no. 1564, *fide* Drake del Castillo, Illustr. Fl. Ins. Mar. Pacif., p. 285. 1892.

Chamaesyce Hookeri J. C. Arthur, Torreya **22**: 30. 1922.

Leaves more or less repand-denticulate; styles distinct to base.....*E. Hookeri*
Leaves hardly repand, entire; styles connate at base.....var. *β. integrifolia*

Shrub 0.9 rarely up to 1.8 m. tall, glabrous, pale throughout, cauline nodes conspicuous; branches slender, subherbaceous, flexuous, weakly nodose, internodes more often 2–4 cm. long. Leaves opposite and distichous, petiole obsoletely hispidulous and about 2–4 mm. long; blade ovate or rarely subrotund, at apex acute or more rarely subobtuse, at base cuneate rotundate or subcordate often oblique, at margin more or less repand-denticulate, membranaceous, appearing polished beneath, 2–5 cm. long and 1.5–3 cm. wide, lateral veins inconspicuous; stipular body a low margin-like ridge. Capitula axillary and terminal, single on pedicels about 1–2 mm. long or several in simple or compound cymes (these commonly 1 to a node and arising alternately on each side of stem, often 2–5 cm. long); cyme branches multibracteate with pairs of minute rounded scarious bractlets but bearing only 1–3 capitula at their ends. Involucre minute, turbinate, outwardly glabrous, bearded at the throat, 1–2 mm. tall; glands 4 or even 5, transversely ovate; lobes triangular-ovate, truncate; staminophores more often not exserted. Capsule exserted, cernuous, finally glabrous, 2.2–2.8 mm. tall, cocci slightly carinate; styles distinct to base, their short branches thickened. Seeds ovate- tetragonal, grayish to brownish-red, 1.2–1.5 mm. long, scrobiculate with reticulate ridges and variously shaped but somewhat more often transverse pits.

Type: Collected by *Lay and Collie* (on Captain Beechey's Voyage), Oahu, 1826–27 (Kew).

Distribution: Southeastern Oahu.

Specimens examined: *Otto Degener 8101*, common on open wooded slope, middle ridge of Niu Valley, Oahu, June 4, 1932 (Degener, 4 sheets; Field; New York); *Charles N. Forbes 1578-O*, Wailupe Valley, Oahu, April 12, 1910 (Field; Missouri); *Forbes* (with *J. C. Bridwell*) *2463-O*, same locality, April 11, 1917 (Bishop); *Forbes 2503-O*, same locality, May 4, 1917 (Field); *Forbes 2528-O*, Wailupe, Oahu, January, 1919 (Bishop; Field); *Charles Gaudichaud*, Hawaiian Isls., October, 1836 (Berlin, labeled *Anisophyllum virgatum* by Klotzsch & Garcke and evidently their type); *Gaudichaud 287*, same locality, September–October, 1836 (Paris); *Dr. William Hillebrand*, Nuuanu, Oahu (Kew); *Hillebrand*, Niu, Oahu, 1867 (Berlin); *Hillebrand 50*, low shrub, Oahu (Kew); *Hinds*, Oahu (Kew); *Lay & Collie* (Capt. Beechey's Voyage), Oahu, 1826–27 (type, Kew); *Horace Mann*, Hawaiian Isls. (Berlin); *Mann & William T. Brigham*, Hawaiian Isls., 1864–1865 (Cornell); *Mann & Brigham 103*, ridge east of Manoa, Oahu, October, 1865 (Bishop; Cornell; Gray;

Missouri); *Adelbert von Chamisso*, Oahu, 1816–17 (Berlin, where labeled *Anisophyllum virgatum* by Klotzsch & Garcke; Leningrad, 3 sheets).

Euphorbia Hookeri var. β. **integrifolia** Hillebrand, Fl. Haw. Isls., p. 397. 1888.

Leaves hardly repand, entire. Capitula singly disposed or few in short cymes (1–3.5 cm. long). Styles connate at base.

Type: Collected by *Dr. William Hillebrand*, western Maui (Berlin).

Distribution: Western Maui (Hillebrand cites also Lanai).

Specimens examined: *Otto Degener 8073*, dry mountain near Waihee, west Maui, July 2, 1927 (Degener, 2 sheets; New York); *Hillebrand*, west Maui (type, Berlin); *Hillebrand*, same locality (Kew); *Hillebrand*, Kanapali, west Maui (Gray).

13. **Euphorbia festiva** Sherff, Bot. Gaz. **97**: 589. 1936.

Chamaesyce festiva (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Shrub; branches glabrous, sulcate, nodose, the internodes 1–1.4 cm. long and 1–2 mm. thick; branchlets suberect, angulate, sulculate, sparsely hispidulous above, their internodes commonly 0.5–1 cm. long and 0.5–1 mm. thick, nodes twice as thick as internodes. Leaves opposite and distichous, the slender petiole glabrate and only about 1 mm. long; blade oblong or more rarely ovate-oblong, at apex often very minutely emarginate and obtuse or subrotund, at the oblique base nicely and broadly subcordate or even moderately cordate, on each margin very narrowly indurated and not truly revolute but commonly very obsoletely 1–8-denticulate, membranous, on both surfaces glabrous, paler underneath, 7–16 mm. long and 5–11 mm. wide; stipular body triangular, pubescent, under 1 mm. tall. Capitula terminal (at least so far as observed on 8 flowering branchlets found), solitary; involucre subsessile, campanulate, outwardly glabrate or supernally hispidulous, about 1.8–2.1 mm. tall; glands commonly 5, transversely oblong, not or obsoletely appendiculate, more or less contiguous; lobes hirtous; stamens exserted. Capsule (mature) not known; styles connate at base, strongly bifurcate, branches thickened.—Description drawn from the single type branch, which is less than 1.7 dm. long.

Type: Collected by *Thomas Nuttall*, Oahu, 1835 (Kew).
Distribution: Present, at least a century ago, on Oahu.

Specimens examined: *Nuttall*, Oahu, 1835 (type, Kew).

Nuttall had designated the type as a new species, but later Edmond Boissier determined it as *Euphorbia multiformis* H. & A. The oblong basally wide-cordate or -subcordate leaves, with their obsolete yet definitely visible teeth, easily distinguish Nuttall's plant, however, from that species. In the vast assortment of specimens of Hawaiian *Euphorbiae* studied by me from the principal European and American herbaria, no others have been found to belong here, and it may well be that during the century since Nuttall collected on Oahu the species has become extinct. (An inaccuracy in my original description [*loc. cit.*] of the branchlets, making the length of their internodes apply erroneously to the branchlets themselves, has been corrected above.)

14. Euphorbia Degeneri Sherff, Bot. Gaz. **97**: 583. 1936.

Euphorbia cordata Meyen, Beiträge Bot. Reise Erde **2**: 150. 1843 (not Schrank, Baier. Fl. **1**: 747. 1789; nor Räuschel, Nomencl. Bot. edit. III, p. 140. 1797); Boiss. Icon. Euphorb., *tab. 4.* 1866 (where leaves are erroneously shown as decussate instead of distichous).

Anisophyllum cordatum Klotzsch & Garcke, *ex* Kotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 38. 1860.

Chamaesyce Degeneri (Sherff) Croiz. & Deg. *ex* Deg., Fl. Haw. Dec. 9, 1936.

Leaves finally glabrate unless toward base.....*E. Degeneri*
Leaves densely pilose.....var. *β. molokaiensis*

Low prostrate undershrub, 3–6 dm. tall; branches thickish, nodose, often tortuous, tomentose, with short to very short internodes. Leaves distichous, subsessile or virtually sessile, orbicular, entire or sometimes very obscurely crenulate, cordate at base, often emarginate at apex, subfleshy, inconspicuously nerved, glabrous or glabrate or toward base slightly hispidulous, mostly 1–2 cm. wide, often finally turning reddish;

stipules low, obtuse, hairy-fringed. Capitula terminal and in upper axils, solitary or more rarely in groups of 3. Involucre subsessile, campanulate-hemispherical, mostly less than 2 mm. long, outwardly glabrous; glands substipitate, somewhat concave, transversely oblong and often bordered with a narrow membranous appendage; lobes ovate, hispid; staminophores exserted, their bractlets deeply slit. Capsule exserted, inclined, ovate, finally glabrate, about 2 mm. long; cocci slightly carinate, inconspicuously salient-punctulate; styles distinct, bifid and at tips of branches somewhat thickened. Seeds oblong, tetragonal, truncate at base, obtuse at apex, white, scrobiculate, ±1.7 mm. long.

Type specimen: Collected by *Dr. Francis Julius Ferdinand Meyen,* no. *62,* "Diamond Hill" (Diamond Head), Oahu, 1831 (Berlin).

Distribution: Along coast, Oahu and northwesternmost Molokai; also at widely scattered spots along coast of Kauai, West Maui, and Hawaii.

Specimens examined: *E. Christophersen 1398,* alt. ±5 meters, in sand, Kaena Point, Oahu, December 14, 1930 (Field, 2 sheets); *Dr. C. Montague Cooke, Jr.,* Laniloa, Oahu, February 1, 1919 (Bishop); *Otto Degener H-220,* coastal sand dune, Waimanalo, Oahu, April 8, 1923 (New York); *Degener 8067 pro parte,* along beach in arid region, near Waiakanapo, Molokai, April 19, 1928 (Degener); *Degener 8068,* arid region near coast, same locality and date (Field); *Degener 8097,* Koko Head, Oahu, October 25, 1926 (Degener); *Degener 8099,* along shore, Niulii, Kohala, Hawaii, March 23, 1930 (Degener; New York); *Degener* (similarly) *8099,* coastal dune, Waimanalo, Oahu, April 8, 1923 (Degener, 2 sheets); *Abbé Urbain Faurie 461,* on shores, Halawa, Hawaii, June, 1909 (Bishop; Delessert; Paris); *Faurie 463,* on shore at Hanapepe, Kauai, December, 1909 (Paris); *Charles N. Forbes,* beach between Diamond Head and Koko Head, Oahu, December 4, 1908 (Field; Missouri); *Forbes* (with *John F. G. Stokes) 316-M,* West Maui, February, 1913 (Bishop); *Forbes 612-Mo,* Moomomi, northwestern Molokai, March 24, 1912 (Bishop); *Forbes 1066-O,* Diamond Head, Oahu, January 26, 1909 (Field); *Forbes 1078-O pro parte,* same locality and date (Field); *Forbes 1649-O,* Kaena Point, Oahu, February 25, 1911 (Field); *Charles Gaudichaud,* Hawaiian Isls., October, 1836 (Delessert; Missouri); *Gaudichaud 286,* same locality, September–October, 1836 (Paris); *Amos Arthur Heller 2019,* Diamond Head, Oahu, March 28, 1895 (Bishop; Cornell; Field, 2 sheets; Gray; Kew; Missouri; New York; Paris; U. S.); *Dr. William Hillebrand,* Honolulu, Oahu (Vienna); *Hillebrand,* Diamond Head, Oahu (Berlin); *Hillebrand,* Kailua, Oahu, 1867 (Berlin); *Hillebrand 47,* Oahu (Kew); *Hillebrand 47-b,* Diamond Head, Oahu (Kew); *Dr. Albert S. Hitchcock 13333,* sand dune near coast, Kahuku, Oahu, June 26, 1916 (U. S.); *Rev. J. M.*

Lydgate, Mahaulepu, Kauai (Bishop); *Vaughan MacCaughey*, Waimanalo, Oahu (Bishop); *MacCaughey 12923*, Koko Head, Oahu (Bishop); *Horace Mann & William T. Brigham 106*, outer slope of Leahi, Oahu (Bishop; Cornell; Field, 3 sheets; Gray; Missouri; New York; U. S.); *Maximowicz*, Oahu (Kew); *Dr. Meyen*, Oahu, 1831 (type, Berlin: cotype, Vienna); *George C. Munro 531*, Moomomi sand hills, northwestern Molokai, July 26, 1922 (Bishop); *Marie C. Neal*, on beach, Kawailoa, Oahu, July 14, 1929 (Bishop); *Jules Remy 589*, Oahu, 1851–1855 (Field; Paris); *Joseph F. Rock*, Moomomi beach, northwestern Molokai, March, 1910 (New York); *Rock 7078 pro parte*, same locality and date (Bishop; Field; Gray; New York); *Rock 10100*, Waialua beach, Oahu, May, 1911 (Field; Gray); *Harold St. John 9983*, Kaena, beach 2 miles west of Kawaihapai, Oahu, November 3, 1929 (New York); *John F. G. Stokes*, Molokai, 1909 (Bishop); *D. LeRoy Topping 3294*, Kawela Bay, Oahu, October 9, 1926 (Degener); *United States Exploring Expedition*, Diamond Head, Oahu, 1840 (Gray; Missouri; U. S.); *Dr. Heinrich Wawra 2344*, Hawaiian Isls., 1868–1871 (Vienna); *Gerrit Parmile Wilder 87*, sandy seacoast, Kailua, Oahu, April 7, 1924 (Bishop).

Euphorbia Degeneri var. β. **molokaiensis** Sherff, Bot. Gaz. **97**: 583. 1936. (Pl. 11.)

Leaves and capsules velvety-pilose.

Type: Collected by *Joseph F. Rock*, no. *7078 pro parte*, Moomomi, Molokai, March, 1910 (Gray).

Distribution: Near coast, northwestern Molokai.

Specimens examined: *Otto Degener 8067 pro parte*, along beach in arid region, near Waiakanapo, Molokai, April 19, 1928 (Degener; Field, 2 sheets); *Rock 7078 pro parte* (type, Gray: cotype, Vienna; cotype fragment, Field).

15. **Euphorbia hirta** L., Sp. Pl., p. 454. 1753.

Euphorbia pilulifera of many authors, not of the Linnean Herbarium (*fide* N. E. Brown) nor of the Linnean description (for various additional synonyms and critical notes pertaining to the Linnean concept, see N. E. Brown *in* Thiselton-Dyer, Fl. Trop. Afr. **6**, pt. 1: 496. 1911; but *cf.* Farwell, Rhodora **38**: 332. 1936).

Annual herb, 1–4 dm. tall; stems erect or decumbent at base, simple or dichotomously branched, long-pilose (hairs spreading, yellowish, several-celled, attenuate, upper ones subnumerous, lower ones remote or almost lacking) and in addition more or less pubescent (with diminutive hairs, these arcuate and subappressed). Leaves opposite, petiole 1–3 mm. long; blade obliquely lanceolate or ovate or rhomboid-oblong, at apex acute or subobtuse, at base rounded on one side and cuneate on the

other, at margin serrulate, membranaceous, on both surfaces sparsely (or underneath scarcely) appressed-hispid (hairs on upper surface longer), 1–4 (more rarely –5) cm. long and 0.5–2 cm. wide; stipules separate, minute, subulate. Cymes axillary, pedunculate, 6–13 mm. in diameter, globose or divided into 2 or 3 subglobose heads; peduncle minutely pubescent (hairs arcuate, whitish, subappressed), 2–12 mm. long. Capitula numerous. Involucre staminate or hermaphroditic, minute (about 0.7 mm. tall), obconic or suburceolate, on outer surface sparsely or subdensely (more or less appressed-) hispid; glands 4 (the 5th replaced by a sinus through which passes the recurved stipe of the fruiting capsule), erect, a little longer than the lobes, linear when viewed sidewise, orbicular or oblong-orbicular (when viewed from above) at the truncate apex, bearing a minute rounded dorsal appendage just below the apex; lobes 5, deltoid, acute, hairy-fringed (seemingly fimbriate). Capsule globose-trigonous, sparsely or densely appressed-hispid, less than 0.8 mm. tall; cocci definitely carinate; styles short, deeply bifurcate into slender branches, these truncate and somewhat thickened at apex. Seeds oblong, tetragonal, reddish, at base subtruncate at apex obtuse, about 0.65–0.75 mm. long, the faces transversely somewhat rugulose.

Type: Probably from British East India *(cf.* Linnaeus, *loc. cit.)*. It is still extant (Linnaeus; *cf.* N. E. Brown, *loc. cit.*, p. 497).

Distribution: A widely spread weed occurring throughout the tropics and found also in some subtropical regions; now common on all or most of the Hawaiian Islands.

Specimens examined: *Frederick Debell Bennett 64*, Oahu, 1833–36 (Berlin); *Edward L. Caum 13*, Lehua (an islet near Niihau), April 18–20, 1931 (Bishop); *D. R. Chisholm*, Midway Isl., December, 1931 (Bishop); *Otto Degener 9112*, weed in dry locality, University of Hawaii Campus, Honolulu, Oahu, November, 1926 (New York); *"Mr. Deell,"* Byron's Bay (i. e., Hilo Bay), Hawaii (Paris); *Rev. John Diell 100*, Oahu (Kew); *Abbé Urbain Faurie 516*, in herb-grown places, Halawa, Hawaii, June, 1909 (Paris); *Charles N. Forbes*, Museum Grounds, Honolulu, Oahu, July 15, 1908 (Bishop); *Forbes*, Honolulu, same date (Missouri); *Forbes*, slopes of Puu Kaala, Mokuleia, Oahu, April 26–May 16, 1912 (Field); *Forbes 7-H*, Puuwaawaa, Hawaii, June 8–14, 1911 (Bishop); *Forbes 471-K*, roadsides, Lihue, Kauai, October 4, 1916 (Bishop); *Forbes 1022-O*, Museum grounds, Honolulu, Oahu, January 15, 1909 (Bishop; Missouri); *Forbes 1075-O*, up and

around Diamond Head, Oahu, January 26, 1909 (Bishop); *D. Wesley Garber*, Old Naval Station, Honolulu, Oahu, October 16, 1919 (Bishop); *E. S. Handy*, near the landing, Niihau, August 14, 1931 (Bishop); *Amos Arthur Heller 1980*, "in and on the slopes of Makiki," Oahu, March 21, 1895 (Field; Kew; Missouri; New York; Paris; U. S.); *Heller* (similarly) *1980*, Honolulu, Oahu, March 22, 1895 (Bishop; Cornell; Field); *Heller* (similarly) *1980*, same place, March 27, 1895 (Field); *Albert S. Hitchcock 13685*, Honolulu, Oahu, June 15, 1916 (U. S.); *Hitchcock 15144*, sandy beach, West Molokai, October 12, 1916 (U. S.); *Edward P. Hume*, Kalihi Street, near Bishop Museum, Honolulu, June 10, 1931 (Bishop); *Hume 168*, alt. 30 meters, dry place at seaside, Koko Head, Oahu, January 24, 1931 (Bishop); *Lay & Collie* (Capt. Beechey's Voyage), Oahu, 1826–27 (Kew); *Horace Mann & William T. Brigham 35*, garden and roadside weed, Oahu (Bishop; Cornell; Missouri); *Charles F. Millspaugh 2587 and 2588*, Oahu, September 12, 1911 (Field); *George C. Munro 318*, Koele, Lanai, November 2, 1913 (Bishop); *Marie C. Neal*, Rabbit Island, Oahu, March 16, 1930 (Bishop); *Neal*, alt. 15–25 ft., rocky slope in gully, close to ocean, fresh-water seepage, Koko Crater, Oahu, January 18, 1931 (New York); *Jules Remy 590, Oahu*, 1851–1855 (Paris); *Remy 597*, same locality and date (Paris); *Joseph F. Rock*, Parker Ranch, Hawaii, June, 1909 (Bishop); *Rock 754*, Punaluu Railroad Station, Oahu, December 3, 1908 (Bishop); *John F. G. Stokes*, south half of Niihau, January, 1912 (Bishop).

16. **Euphorbia Hypericifolia** L., Sp. Pl., p. 454. 1753.

Chamaesyce Hypericifolia Millsp., Field Mus., Bot. Ser. 2: 302. 1909.

Euphorbia bifida Hook. & Arn. *ex* St. John & Hosaka, Weeds Pineapple Fields Haw. Isls. (Univ. Haw. Res. Publ. 6), p. 105, and *plate* (p. 104). 1932 (not Hook. & Arn., Bot. Beech. Voy., p. 213. 1836). (For other synonyms and critical notes see Boiss. *in* DC., Prodr. 15, pt. 2: 23. 1862; also N. E. Brown *in* Thiselton-Dyer, Fl. Trop. Afr., 6, pt. 1: 498. 1911.)

Annual herb, erect, erectly branched from base or at times simple, 0.7–4.5 dm. tall; the simple or alternately branched stems glabrous or slightly pubescent. Leaves opposite, petiole slender but very short (1–2 mm.); blade variously oblong or linear-oblong to oblong-lanceolate elliptic or ovate, at apex subacute to rounded, at base oblique, marginally serrulate (the tiny teeth more or less spinulose) or rarely entire, membranaceous, glabrous or on one or both surfaces somewhat pubescent, 0.6–3.8 cm. long and 4–18 mm. wide; stipules highly variable but often partly or wholly connate into a single interpetiolar narrowly triangular erect supernally diaphanous apically

somewhat fimbriate extension ±3 mm. tall. Cymes axillary, loosely few- to many-capitulate, 0.4–1.9 cm. in diameter; peduncles glabrous or slightly puberulous, 3–18 mm. long, often with a pair of leaves at apex; bracts lanceolate, acuminate, ciliate or entirely glabrous, 1–1.5 mm. long. Involucre obconic to campanulate, glabrous or puberulous, about 1 mm. tall, shortly pedicellate; glands 4, orbicular or transversely elliptic, inconspicuous because of the large white or finally somewhat pinkish petaloid appendages (these transversely elliptic or oblong, 0.5–0.7 mm. broad, entire); lobes 5, deltoid-subulate, ciliate. Capsule depressed-globose, trigonous, glabrous or puberulous, about 1.2 mm. tall and about 1.5 mm. thick, cocci carinate; styles slender, distinct to base, deeply bifurcate. Seeds oblong-ellipsoid to oblong-ovoid, tetragonal, reddish-brown or overcast with a grayish-white or glaucescent hue, somewhat transversely rugulose, about 0.8–0.9 mm. long.

Type: Probably came from British East India (Linnaeus).

Distribution: Widely distributed throughout all warm regions. St. John and Hosaka (Weeds of the Pineapple Fields Haw. Isls., p. 105. 1932), under *their* synonymous, "*E. bifida* H. & A.," describe the occurrence for the Hawaiian Islands as follows: "found in dry and in moderately moist places. East and south Kauai: abundant; Oahu: abundant; Molokai: occasional; Lanai: common; east and west Maui: common; Hawaii: occasional."

Specimens examined: *Charles N. Forbes*, roadsides, Manoa Valley, Oahu, January, 1913 (Bishop); *Forbes 2445-O*, roadside near Niu, Oahu, April 5, 1917 (Field, 2 sheets); *Albert S. Hitchcock 13913*, weed on edge of sugar-cane field, Schofield Barracks, Oahu, June 30, 1916 (U. S.); *Hitchcock 14079*, along roadside, Manoa Valley, Oahu, August 1, 1916 (U. S.); *A. F. Judd 56*, near government road, Wahiawa, Oahu, July 19, 1926 (Bishop); *Mr. Pope 3*, Honolulu, Oahu, August, 1924 (Bishop).

17. **Euphorbia Thymifolia** L., Sp. Pl., p. 454. 1753.

Anisophyllum Thymifolium Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 25. 1860. (Various other synonyms omitted here.)

Annual herb; stems several or many, filiform, prostrate, very

much branched, curly-haired, mostly 1–2 dm. long. Leaves opposite, the petiole ±0.4 mm. long; blade oblong, at apex obtuse, at base suboblique, at margin serrulate-crenulate, glabrous or more often on lower surface appressedly hirtous, mostly 3–7 mm. long; stipules elongately lanceolate-subulate, hairy-fimbriate. Capitula axillary, mostly congested upon much-abbreviated axillary racemes. Involucre turbinate, outwardly appressed-hirtous but inwardly (except for the short and ciliolate lobes) glabrous, deeply cleft, under 1 mm. long; glands very minute, stipitate, ovate-rounded, with an equally wide or narrower and 2–3-lobulate appendage; pedicel usually less than half as long as involucre, sparsely hirsute. Capsule very shortly stipitate and even when young not cernuous, ovoid, appressed-hirtous, about 1 mm. tall; cocci obtusely carinate; styles distinct, slender, ±0.5 mm. long, deeply bifurcate. Seeds oblong-tetragonal, reddish, transversely 4–5-sulcate, about 0.6 mm. long.

Type: See discussion.

Distribution: Adventive from the Old World; known only from Oahu and Kauai.

Specimens examined: *Abbé Urbain Faurie 488 pro parte*, Kapoho, Kauai, May, 1909 (Delessert; a second sheet of this number is of true *E. prostrata*); *D. Wesley Garber 5*, Old Naval Station, Honolulu, Oahu, October 16, 1919 (Bishop).

Most material heretofore referred to *E. Thymifolia* is seen to belong to *E. prostrata*. The *Garber* material, however, was very kindly submitted for me by Sir Arthur W. Hill, Director of the Royal Botanical Gardens of Kew, to Dr. J. Hutchinson of the Kew Herbarium, and Sir Arthur now writes: "The *Euphorbia* . . . has been compared very carefully with the type of *Euphorbia Thymifolia* L. in the Linnean Herbarium at Burlington House, and with our Indian material, and Dr. Hutchinson considers it to be this species."

18. Euphorbia prostrata Aiton, Hort. Kew. **2**: 139. 1789. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 47. 1862.)

Annual herb, stems several, prostrate, slenderly filiform, alternately branched, puberulous with minute curved hairs

on upper (dorsal) side at least along median line, glabrous beneath (ventrally), 0.5–2 dm. long. Leaves opposite, petiole glabrous and ±1 mm. long; blade oblong to elliptic or slightly oblong-obovate, at apex obtuse to rounded, at base oblique, at margin distinctly or obsoletely denticulate and sometimes ciliate, glabrous on both surfaces or on lower surface sparsely puberulous especially toward apex, 2–6 mm. long; stipules on upper side of stem usually distinct linear and pilose, those on lower side united into one deltoid or deltoid-ovate body, this apically laciniate-toothed. Capitula in short axillary leafy racemiform clusters, with 1 axillary capitulum to each pair of reduced leaves; or clusters at times reduced, with 1–3 capitula on a short peduncle, and with 1–3 pairs of minute spatulate leaves. Involucre campanulate or elongate-turbinate, glabrous or very slightly puberulous, 0.5–0.65 mm. long; glands 4, minute, suborbiculate, appendage very narrow or obsolete; lobes 5, ovate, pectinate-ciliate; pedicel glabrous, 0.5–1 (here and there one up to 2.5) mm. long. Capsule cernuous, subovate-orbiculate in side view, along and sometimes near the acute angles whitish-ciliate, otherwise mostly very glabrous, about 1.1–1.2 mm. tall; styles distinct, exceedingly short (only about 0.15 mm. long), deeply bifurcate, the branches thickened at apex. Seeds narrowly ovoid, truncate at base, obtuse at apex, tetragonal, at first reddish but finally grayish, ±0.8 mm. long, the faces transversely 5–7-sulcate.

Type specimen: Cultivated by Philip Miller in 1758, from seed obtained in the West Indies. Not seen by me but probably still extant (British or Kew).

Distribution: Native of tropical America but now widely spread in other warm parts of the earth; in Hawaiian Islands found on Kauai, Oahu, Lanai, West Maui, Kahoolawe, and doubtless elsewhere.

Specimens examined: *Abbé Urbain Faurie 486*, in fields, Honolulu, Oahu, April, 1909 (Bishop; Paris); *Faurie 488 pro parte*, Kapoho, Kauai, May, 1909 (Delessert); *Charles N. Forbes*, Kahoolawe, February 10–March 10, 1913 (Bishop); *Forbes 83-M*, Napili, West Maui, May, 1910 (Bishop); *Forbes 1023-O*, Honolulu, Oahu, January 15, 1909 (Bishop; Missouri); *Amos Arthur Heller 1981*, Makiki, Oahu, March 21, 1895 (Field; Gray; Kew; Missouri; New York; Paris, 2 sheets; U. S.); *Albert S. Hitchcock 13717*, rocky soil near stream, Honolulu, Oahu, June

15, 1916 (U. S.); *George C. Munro 197* and *289*, Koele, Lanai, November 2, 1913 (Bishop); *John F. G. Stokes*, Popoia (islet near Kailua, Oahu), November, 1915 (Bishop).

Most of the material in the Hawaiian Islands which has passed heretofore for *Euphorbia Thymifolia* L. is referable to this species.

Section 2. Poinsettia (Graham) Boissier

Sect. 2. Poinsettia (Graham) Boissier *in* DC., Prodr. **15**, pt. 2: 10. 1862; genus *Poinsettia* Graham, Edinburgh New Philosoph. Journ. **20**: 412. 1836.

Our species introduced; erect annuals. Leaves entire, dentate, or sinuate, all or only upper ones opposite, the uppermost often colored, especially near base. Stipules reduced to small glands. Capitula in terminal clusters. Glands 3 or 4 or more, often solitary, somewhat cup-shaped; lobes 4 or 5, deeply fimbriate-toothed. Interfloral bracteoles fimbriate-lacerate. Seeds ecarunculate or very minutely carunculate.—Nos. 19–20.

19. Euphorbia heterophylla L., Sp. Pl., p. 453. 1753.

Euphorbia heterophylla var. *genuina* Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.

Poinsettia heterophylla Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 104. 1860.

Poinsettia Edwardsii Klotzsch & Garcke *ex* Klotzsch, *loc. cit. (fide Boiss., loc. cit.).*

Only the upper leaves pandurate.....*E. heterophylla*
Lower leaves mostly pandurate, upper ones commonly pandurate or querciform .....var. *β. cyathophora*

Annual or at times biennial or perennial, erect, bright green, pubescent to subglabrous, 3–9 dm. tall; stem simple or branched, woody below, the branches ascending or lower ones spreading, leafy at their ends. Leaves alternate except for topmost ones, the slender petiole more often 1–4 cm. long; blade polymorphous, thin, commonly 3–8 cm. long, that for lower and median leaves ovate or rhombic-oblong or lanceolate-

linear, its margin entire or undulate or even irregularly dentate or sinuate; that for the upper or floral leaves broader and dentate or often panduriform and blotched with purple or red; stipules reduced to small glands. Inflorescence of corymbulose and somewhat dense cymes, these subtended by the uppermost leaves. Involucre campanulate or cup-shaped, glabrous, about 2–2.3 mm. tall; glands 1 or few, exappendiculate, substipitate, in sinuses of the 5 ovate to oblong fimbriate lobes; pedicel short (usually about 0.5–0.6 the involucre's length), glabrous. Capsule glabrous or minutely pubescent, cernuous on a short glabrous stipe, about 4 mm. tall and somewhat thicker; cocci plump, the keel a mere line. Seeds oblong-ovoid, subterete, blackish but densely covered with grayish-brown tubercles (the larger of these sometimes dilated and appearing somewhat crested), ecarinate.

Type: Not seen by me.

Distribution: In the United States from Illinois and Minnesota south to Florida and Texas; in Mexico, Central America, Bolivia, and various other warm regions; in the Hawaiian Islands apparently represented only by the variety *cyathophora*.

Specimens examined: None (that is, from Hawaiian Islands).

Probably not yet adventive in the Hawaiian Islands, although erroneously so cited by many authors. Thus, for example, Hillebrand remarked in 1888 (Fl. Haw. Isls., p. 398) that *Euphorbia heterophylla* L. had been collected by him many years before in the upper parts of Nuuanu, Oahu, but that he had not met with it since. Of the somewhat similar *E. geniculata* Ort. he wrote, "which showed itself in gardens of Honolulu before my departure." *Hillebrand 43*, labeled by him "*Euphorbia* (naturalized?) Nuuanu Valley Oahu," had been received at Kew in July, 1865, and was determined by someone as *E. heterophylla* L. Its strongly carinate seeds show it to be *E. geniculata*, however. And, from the fact that *E. geniculata* was reported by Hillebrand only as having shown itself in gardens at Honolulu before his departure (in 1871), it is clear that the Kew specimen must represent the basis of his citation of

E. heterophylla L. (the more so because his own herbarium as it is preserved today at Berlin is seen to lack a specimen of his *E. heterophylla,* indicating that he probably depended upon notes which he had taken long before).

Degener (Fl. Haw., June 30, 1932) misinterprets Hillebrand's *E. heterophylla* as referring in reality to the var. *cyathophora* (treated below). However, that variety differs sharply not only in its mostly pandurate leaves (the floral ones commonly purplish- or reddish-splotched) but in its more rounded, ecarinate seeds.

Euphorbia heterophylla var. β. **cyathophora** (Murray) Grisebach, Fl. Brit. West Ind., p. 54. 1859; *cf.* Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.

Euphorbia cyathophora Murray, Comm. Goett. **7**: 81, *tab. 1.* 1786.

Poinsettia cyathophora Klotzsch & Garcke *ex* Klotzsch, Linn. natürl. Pflanzenkl. Tricocc. Berl. Herb. Allgem. natürl. Ordn. Euphorb., p. 104. 1860; Degener, Fl. Haw., description and plate, June 30, 1932.

Leaves mostly pandurate with 2 or 4 obtuse but often acutely tipped lobes, rarely some basal ones ovate, uppermost ones at times less pandurate and somewhat more querciform.

Type: Not seen by me but represented by the type plate (Murray, *loc. cit.).*

Distribution: Native of tropical America but now naturalized in various other warm parts of the earth; established in recent years on Oahu.

Specimens examined: *Otto Degener 2491,* roadside, Kaimuki, Oahu, February 3, 1928 (New York); *Degener 8008,* along coast in arid region, Waimea, Oahu, July 9, 1926 (Missouri; New York); *Charles N. Forbes 2443-O,* roadsides at Kaimuki, Oahu, April, 1917 (Bishop).

20. Euphorbia geniculata Ortega, Nov. Rar. Pl. Hort. Matr. Decad., p. 18. 1797. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 72. 1862.)

Similar to *E. heterophylla,* but somewhat coarser; leaf blades not pandurate or quercine, mostly oblong or ovate (often subrhomboidally so), acute or acuminate at apex, entire

or obsoletely (sometimes near base definitely) dentate, floral ones not purplish- or reddish-splotched; involucre cylindric-turbinate, very shortly pedicellate; lobes 5–7, oblong-lanceolate; seeds slightly larger (about 3–3.2 mm. long), more angular and on outer face carinate, less densely tuberculate.

Type specimen: Not seen by me.

Distribution: Texas, northern Mexico, West Indies, etc. Now established on Hawaii, Oahu, Kauai (Waimea, *fide* Heller, Minn. Bot. Studs. **1**: 845. 1897), Niihau, and perhaps elsewhere.

Specimens examined: *Edwin H. Bryan, Jr.*, roadside weed, Schofield Road, Oahu, February 10, 1929 (New York); *Bryan 701*, side of trail, Hauula, Oahu, April 14, 1929 (Bishop); *Otto Degener 1635*, corn field, Manoa Valley, Honolulu, Oahu, September 25, 1922 (New York); *Abbé Urbain Faurie 475*, in gardens, Halawa, Hawaii, June, 1909 (Delessert; Paris); *Faurie 517*, Honolulu, Oahu, November, 1909 (Bishop; Paris); *Charles N. Forbes*, Nuuanu Valley, Oahu, March 21, 1909 (Bishop; Field; Missouri); *Forbes 1623-M*, Manawainui, south slope of Haleakala, Maui, March 3, 1920 (Field); *Forbes* (with *J. C. Bridwell*) *2441-O*, Waiolae Iki, Oahu, March 2, 1917 (Bishop); *Amos Arthur Heller 2035*, Nuuanu, Oahu, March 29, 1895 (Cornell; Field, 2 sheets; Gray; Kew; Missouri; New York; U. S.); *Heller* (similarly) *2035*, same locality, November 6, 1895 (Paris); *Albert S. Hitchcock 13699*, Honolulu, Oahu, June 15, 1916 (U. S.); *E. P. Hume 55*, University of Hawaii Campus, Honolulu, November 15, 1930 (Bishop); *Dr. Charles F. Millspaugh 2586*, Oahu, September 12, 1911 (Field); *George C. Munro 453*, Honolulu, Oahu, 1916 (Bishop); *Munro 636*, Oahu, 1916 (Bishop); *Marie C. Neal*, roadside, Makiki Valley, Oahu, March 13, 1932 (Bishop); *Joseph F. Rock 780*, Punaluu station, Oahu, December 3–14, 1908 (Bishop); *Harold St. John 9999*, thicket, Uluhulu Gulch, Kaena, Oahu, November 3, 1929 (Bishop); *John F. G. Stokes*, south half of Niihau, January, 1912 (Bishop, 2 sheets, one of more hairy material).

Section 3. Tithymalus (Adanson) Boissier

Sect. 3. Tithymalus (Adanson) Boissier *in* DC., Prodr. **15**, pt. 2: 10. 1862; genus *Tithymalus* [Tournefort] Adanson, Familles des Plantes **2**: 355. 1763.

Ours a single, introduced species, with capitula in a terminal, umbelliform inflorescence; stipules absent; glands long-horned; cocci 2-wing-crested on back; seeds carunculate.—No. 21.

21. Euphorbia Peplus L., Sp. Pl., 456. 1753. (For various synonyms see Boiss. *in* DC., Prodr. **15**, pt. 2: 141. 1862; also

J. B. S. Norton, Ann. Rept. Mo. Bot. Gard. 11: 113, *pl. 30.* 1900.)

Annual herb, stem erect or ascending, 1.5–3 dm. tall, many branches from the base and below the umbel, the lower branches often almost as high as the plant axis, striate. Cauline leaves opposite except for the verticillate ones subtending the umbel, petiolate, the slender petiole up to 1 cm. long; blade obovate to rotund, apically obtuse to truncate or retuse, basally cuneate-narrowed, extremely thin, crisped, 0.5–2.5 cm. long and 0.4–1.2 cm. wide; floral leaves (bracts) opposite, sessile, smaller, more or less ovate or slightly pandurate, basally somewhat oblique, obtuse at both ends, sometimes mucronate, 0.6–1.5 cm. long and 0.5–1 cm. wide. Stipules none. Umbel 3- or sometimes up to 5-rayed, then forking. Involucre campanulate, about 1 mm. tall; glands 4, crescentic, much prolonged at each end into a slender horn; lobes triangular-ovate, hispid-ciliate; pedicel short; stamens 10–15, exserted. Capsule globose-ovoid to rarely depressed-globose, glabrous, slightly cernuous, about 2 mm. tall, deeply 3-parted; cocci very narrowly alate-bicarinate on back; styles distinct, up to 0.5 mm. long, deeply bilobed. Seeds oblong or oblong-ovoid, whitish, about 1.3 mm. long and 0.8 mm. wide, subhexagonal, the two inner faces each with a large lengthwise depression, the four external faces each with 1–4 (mostly 3) commonly large shallow pits in longitudinal rows, sometimes additional pits between the rows, or even 6 rows; caruncle conical, white. (Description in small part from Norton, *loc cit.)*

Type: The Linnean concept was founded upon various earlier citations in literature.

Distribution: Native of Europe but now found elsewhere; in the Hawaiian Islands known from Hawaii, East Maui, and southern Kauai.

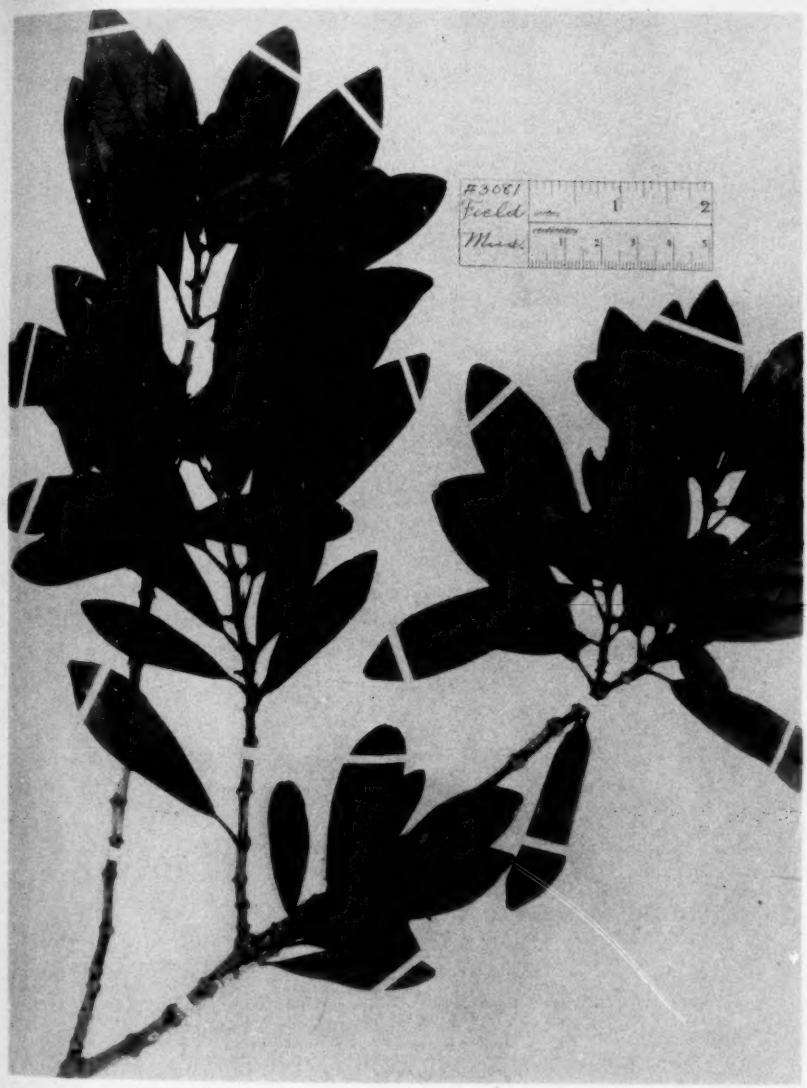
Specimens examined: *Otto Degener,* 17 miles along main road from Kohala toward Waimea, Hawaii, August 13, 1926 (New York); *Degener 9105,* pasture, Honokaa, Kohala, Hawaii, July 28, 1926 (New York); *Abbé Urbain Faurie 464,* fields, Koloa, Hawaii, June, 1909 (Bishop; Delessert; Paris); *Charles N. Forbes,* Makawao, East Maui, August, 1910 (Field; Missouri); *Forbes 202-H,* summit of Hualalai, Hawaii, June 19–21, 1911 (Bishop); *Forbes 1989-M,* Kanaio, south slope of Haleakala, East Maui, March 1, 1920 (Field); *Amos Arthur Heller,* along Hana-

pepe River near the Falls, Kauai, June 24–26, 1895 (Field); *Dr. William Hillebrand*, Kona, Hawaii (Berlin; U. S.); *Albert S. Hitchcock 14818*, ravine, alt. 3600 ft., Kukaiau Ranch, Hawaii, August 19, 1916 (U. S.); *Horace Mann & William T. Brigham 333*, high central plateau of Hawaii, 1864–1865 (Cornell); *Jules Remy 599, Hawaii*, 1851–1855 (Paris).

EXPLANATION OF PLATE

PLATE 2

Euphorbia Remyi var. *molesta* (first type sheet).



SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 3

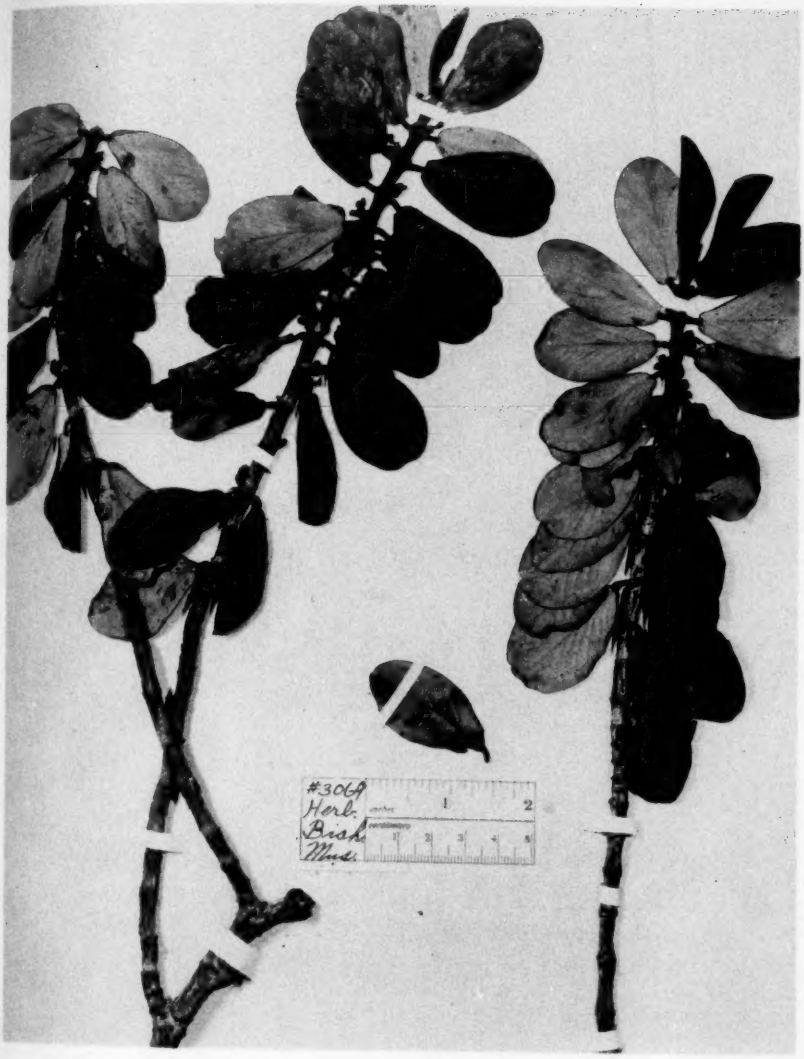
Euphorbia halemanui (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 4

Euphorbia Celastroides var. *moomomiana* (first type sheet).



SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 5

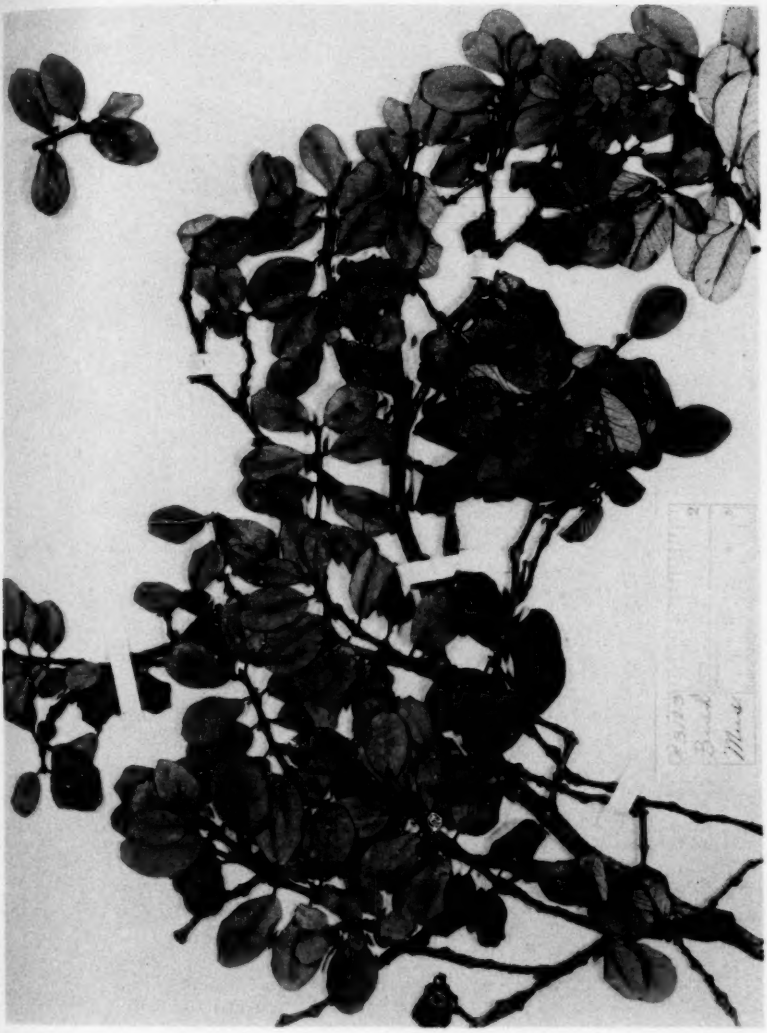
Euphorbia Celastroides var. *kaenana (Degener, Hirai & Park 8038*, in Herb. Degener).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 6

Euphorbia Celastroides var. *halawana* (type).



SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 7

Euphorbia Celastroides var. *hanapepensis* (type).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 8

Euphorbia Celastroides var. *amplectens* (type).

EXPLANATION OF PLATE

PLATE 9

Euphorbia multiformis var. *tomentella* (type).

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EXPLANATION OF PLATE

PLATE 10

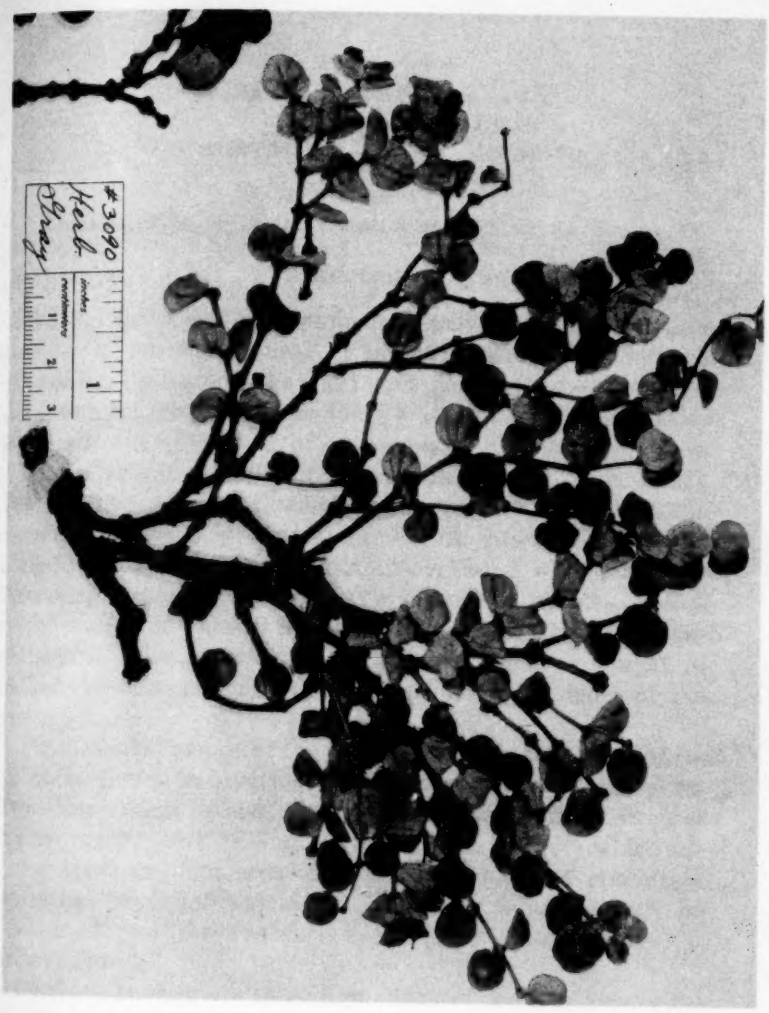
Euphorbia Skottsbergii var. *kalaeloana* (first type sheet).

SHERFF — HAWAIIAN EUPHORBIAE

EXPLANATION OF PLATE

PLATE 11

Euphorbia Degeneri var. *molokaiensis* (type).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THE CALIFORNIAN SALVIAS

A Review of Salvia, Section Audibertia

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FOREWORD

The Salvias which are confined largely to the Californian area are of interest because of the association with them of most of the students of the California flora. Few of the older California botanists but were the discoverers in the field or describers in the herbarium of one or more of these interesting plants. Earliest and foremost were George Bentham, David Douglas, and Asa Gray, and it is largely to these that the section owes its present content. More recently Professor Munz has contributed an authoritative revision, which, save for extensions in range due to recent explorations and the discovery of numerous natural hybrids, would render this work superfluous. Where not otherwise apparent I have sought to indicate by subsectional names the principal students of the group.

The historical aspect of the group is not its sole source of interest, however, fascinating as that backward vista may be. Two other phases present themselves and offer an ever-widening avenue of investigation into the future: the rôle which the group plays in plant economy, and the method of speciation which has prevailed within it. But scant reference may be made to either of these subjects in this paper since both are but little explored.

Confined as they are to arid portions of the Southwest, the Audibertias are components primarily of two shrub formations —the *Larrea-Franseria* formation of the Colorado Desert, and the related *Artemisia californica-Salvia* formation of the coastal plain. Seven species are conspicuous localized elements in the former; five species are important or dominant elements in the latter. The remaining six species are either ubiquitous

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or are associated with a formation contiguous to those mentioned. Ignoring the ubiquitous *S. Columbariae,* two species enter into the desert woodland *(Pinus-Juniperus)* in association with *Artemisia tridentata,* and one enters into the valley woodland *(Quercus-Pinus),* often in association with *Artemisia californica.* Two enter into the drier aspects of the chaparral (chamisal). But the greatest impress is made in the coastal sage formation *(Artemisia californica),* ranging along the coastal plain and in the foothills of the coastal ranges from the Bay region in central California to Rosario in Lower California. Here one species or another may be the dominant and sometimes seemingly sole species for thousands of acres. Because of its low elevation and relatively gentle slope as well as the peculiarities of its climate, this formation has been the one chiefly occupied by man. It is accordingly the one most modified. In southern California the citrus industry is closely correlated with the coastal sage formation. Perhaps this disturbance of the original formation has resulted in more species coming together and consequently more frequent crossing.

There is, then, an abundant body of facts relating to the distribution of these plants, even though their significance may not be understood; one may only surmise the course of speciation and the factors involved. When one considers the remarkable uniformity of flower structure which is seen in the large section Calosphace (470 species or more) the Audibertias appear heterogeneous. In habit there is a tremendous range between *S. carduacea* and *S. apiana* or between *S. Columbariae* and *S. spathacea.* In flower structure the seemingly fundamental and significant structure of the stamens presents an even wider range when one compares those of *S. carduacea* (anthers sessile, the connective divaricate, both thecae fertile) with those of *S. apiana* (half the anthers suppressed, the filament well developed). Here would appear to be ample justification for generic segregation, as was suggested by Greene (the genus *Ramona).* Yet one may proceed step by step from one extreme to the other. What is more significant, the species suggest interchanges of blocks of characters. *S. Munzii* has roughly the foliage of *S. Clevelandii,* the flowers of *S. mellifera.*

S. Brandegei has the flowers and inflorescence similar to *S. mellifera*, the foliage of *S. eremostachya*. *S. Vaseyi* suggests an intermediate condition between *S. apiana* and *S. eremostachya*. And so throughout the whole group blocks of characters reappear in different combinations. The only possible explanation of these facts which occurs to me is that these species have all arisen through hybridization. Such an explanation is given substance by reason of the frequency with which natural hybrids occur: usually when any two species grow together, particularly of the groups Munzia and Jepsonia. Such hybrids are described in the body of the paper. In no sense whatever do the species suggest origin from a single differentiating stock.

It is equally undesirable to hazard a guess as to the origin of the group. Within *Salvia* it appears to be most nearly related to Calosphace, both morphologically and geographically. Within that intricate complex of nearly 500 known species only two species suggest to me a possible connection with Audibertia: *S. axillaris* and *S. clinopodioides*. The corolla and stamens of the former (but not the calyx nor yet the general habit) stand apart from the rest of the section and are suggestive of those of *Salvia spathacea*. The habit of *S. clinopodioides* and particularly the calyx set it off from most of the section Calosphace and are suggestive again of the habit and calyces of *S. spathacea*. Whether these resemblances are genetic or the result of independent and parallel developments it is difficult to say.

To explore adequately these avenues as well as that of the pollination mechanisms will require prolonged studies. Meanwhile the present paper may be considered an introduction. It is based upon an examination of practically all of the extant collections both in this country and abroad and upon a field knowledge extending over a decade or more in which most of the species have been visited throughout their total area of distribution. None but has been studied in the field and most species in the garden as well.

As always, the author is under great obligations to the keepers of the various herbaria here and abroad who so gen-

erously lend valuable material for study. He is particularly under obligations to Dr. Philip A. Munz, Mr. Frank Gander, Mr. French Gilman, and Mr. Joseph Ewan for helpful suggestions and data as to occurrence. He is greatly indebted to Dr. Elbert Ahlstrom for assistance in reading manuscript and proof and checking of bibliographical references. He is under especial obligations to the artist, Mr. Alexander Chudom, whose illustrations require no commendation to be appreciated. These have been prepared by him from living material with the exception of *S. californica* and *S. Brandegei*. Drawings of the flowers were made by the author from living plants and copied in wash by the artist. The calyces are shown without pubescence. The outline maps show the approximate limits of each species in so far as known. The author is further indebted to Mr. William Stewart for pollen smears of several species and hybrids. His obligations should also be recorded to Mr. J. E. Harding for his courtesy at El Arco no less than to Mr. N. R. Vail for his hospitality on Santa Rosa Island.

The chief prior treatments are as follows:

Bentham, G., Lab. Gen. et Sp. 312. 1833, and in DC. Prodr. **12**: 358. 1848.

Gray, A., Syn. Fl. N. Am. **2**: 372. 1878.

Jepson, W. L., Manual Calif. 867. 1925.

Munz, P. A., in Bull. S. Calif. Acad. Sci. **26**: 17. 1927, and in Bot. S. Calif. 443. 1935.

Sect. Audibertia

Audibertia Benth. in Bot. Reg. **17**: 1469. 1831, based upon *A. incana* (not Benth., op. cit. **15**: 1282. 1829).

Ramona Greene in Pittonia **2**: 235, 301. 1892, based upon *Audibertia polystachya* Benth., Lab. Gen. et Sp. 314. 1833.

Audibertiella Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia* Benth., loc. cit.

Annual herbs or shrubs clothed with either simple or branched hairs and usually sprinkled with sessile glistening droplets, less often with stalked glands; leaves quite variable

in size and form, often deltoid-oblong, even hastate, often oblong-elliptical or obovate, rarely rotund or spatulate, rarely pinnatifid, prevailingly bullate-rugose, their margins crenulate or entire, commonly whitened or ashy, seldom entirely glabrous; flowers usually numerous in compact glomerules which are disposed in moniliform spikes, these simple or branched, or frequently solitary and capitate, few-flowered and forming an elongated showy thyrsis in one species or even a thyrsoid spike, subtended by numerous bracts which are usually involucrate, less often few in the axils of the upper leaves and subtended by small bractlets; calyx tubular or turbinate, rarely subequally dentate, the posterior three teeth usually united into a gibbous upper lip which is entire, trimucronate, or even aristate at the tip, the two lower teeth small, free, or more or less united with the upper lip, usually acuminate, even aristate, completely united with the upper in one species, the orifice thus truncate and oblique; corolla-tube cylindrical, flaring somewhat toward the throat, sometimes vertically compressed, thus closing the throat, entirely glabrous within or variously piloseannulate or pubescent, the upper lip ascending, plane, by no means galeate, usually incised and the segments somewhat divaricate, sometimes retuse, less often entire, almost suppressed in one species, the lower lip usually declined, the laterals more or less spreading, the middle either entire or laciniate or erose, sometimes strongly cupped, sometimes plane, sometimes strongly convex or all, depending upon the degree of anthesis; stamens seated in the throat, even toward the middle of the tube, or upon the base of the lower lip, sometimes ascending under the upper lip, sometimes thrust out from the tube or even declined along the lower lip; filament very short, almost wanting in one species, or about equal to the connective, articulated with it, the lower portion and one anther being completely suppressed; style glabrous, its branches either subequal or the posterior shorter; nutlets gelatinous when wetted.[1]

[1] Jepson (Manual) has sought to differentiate between Echinosphace and Pycnosphace, on the one hand, and the remaining species, on the other, by the presence or absence of the gelatinous coat. If mature nutlets are used, all species will be found to afford it in some degree, although *S. funerea* and *S. spathacea* do so but little.

KEY TO THE SUBSECTIONS

Both branches of the connective manifest, bearing perfect anthers; leaves pinnatifid or sinuate-spinose and iliciform (frequently entire in *S. funerea* but spinose at the tip).

Calyx teeth free; long arm of the connective ascending from the base of the lower lip, the shorter projected into the tube, or sometimes *(S. funerea)* both more or less contained within the tube; arachnoid herbs or spinose shrubs ..... ECHINOSPHACE

Posterior calyx teeth joined into a gibbous lip; long arm of the connective ascending under the upper lip, the lower deflexed; annual hispidulous herbs ..... PYCNOSPHACE

Lower arm of the connective usually wholly suppressed, rarely *(S. spathacea)* manifest, and even bearing a minute anther; leaves crenulate or entire.

Stamens ascending under the upper lip and but little surpassing it or not at all, even entirely concealed within the tube *(S. Brandegei)*.

Stout perennial viscid herbs with hastate or deltoid-oblong leaves 8–20 cm. long; corolla-tubes 25–35 mm. long ..... GREENEOSTACHYS

Shrubs with oblong-elliptical, obovate or even linear leaves; corolla-tubes 5.5–9.5 mm. long ..... PARISHIELLA

Stamens thrust forth from the tube or even declined, patently longer than the upper lip ..... JEPSONIA

Subsect. ECHINOSPHACE

Sect. *Echinosphace* Benth., Lab. Gen. et Sp. 302. 1833, based upon *S. carduacea*.

Singular annual herbs with arachnoid pubescence and basal pinnatifid leaves, or shrubs with small leaves usually spinose-toothed and iliciform, sometimes entire but spine-tipped, clothed with branching hairs, rarely glandular; flowers of the annual species borne in dense echinate heads concealed in cottony hairs, subtended by reflexed spinose bracts, of the perennial species disposed in the axils of the upper leaves, subtended by small bractlets; calyx teeth 5, deltoid, subequal and obtuse or acute, or unequal, the lateral pair partly adnate to the upper, all spinose; corolla-tubes of the annual species strongly piloseannulate near the middle, those of the shrubs glabrous or sparsely pubescent, lobes of the upper lip partly free, the middle lobe laciniate, either concave or convex; stamens seated either in the throat or on the base of the lower lip, each bearing two perfect anthers of unequal size, the longer arm of the connective ascending from the base of the lower lip, the shorter thrust into the tube, or sometimes the longer anther contained

wholly within the tube, the filaments short or nearly wanting; style branches equal or nearly so.

A thistle-like annual herb with basal pinnatifid leaves spinosely dentate, arachnoid.....*1. S. carduacea*
Shrubs with leaves mostly iliciform, sometimes entire but spine-tipped.
Calyx teeth deltoid, acute or obtuse, subequal.
Corolla-tubes 5–7 mm. long; connectives 4–6 mm. long.....*2. S. californica*
Corolla-tubes 9–11 mm. long; connectives 1.5 mm. long.....*3. S. funerea*
Calyx teeth lanceolate-spinose; corolla-tubes 9–11 mm. long; connectives 2.5 mm. long.....*4. S. Greatae*

DOUGLASIANA

Singular arachnoid annual herbs with pinnatifid leaves; flowers in compact echinate glomerules, the calyces hidden in cottony wool, subtended by spinose reflexed bracts, disposed in stout moniliform spikes; calyx teeth partly joined, spinose; corolla-tubes strongly pilose-annulate near the middle, the middle lobe of the lower lip large and showy, laciniate, convex.

1. **S. carduacea** Benth., Lab. Gen. et Sp. 302. 1833, based upon a specimen collected by Douglas in California; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Plate 12.

S. gossypina Benth., Pl. Hartweg. 330. 1839, based upon a specimen collected by Hartweg in the Sacramento Valley; the type is in the herbarium of the Royal Botanic Gardens at Kew.

A striking and handsome herb suggesting *Carduus,* arachnoid-woolly throughout, 10–15 cm. tall in forms dwarfed by aridity, as much as a meter tall when luxuriant, its flowering stems one or more; leaves entirely basal, mostly 8–15 cm. long, oblong-elliptical in outline, subsessile, pinnatifid, their lobes deltoid, spinose-toothed, crisped; flowers numerous in globose glomerules subtended by several oblong-iliciform reflexed bracts, solitary or several, disposed at the tips of the usually strict sometimes ternate stems, remote; flowering calyces prevailingly 15–17 mm. long, white with very long soft-cottony hairs in the mat of which they lie buried, teeth of the lower lip about 5 mm. long, the upper three joined to the middle, twice as long, all spinose; corolla a lovely violet, mostly 15–17 mm. long,

strongly and obliquely pilose-annulate near the middle, the lobes of the upper lip subequal to the tube, narrowed near the middle, erose at the tips, the middle lobe of the lower subequal,

Fig. 1. Showing distribution of *S. carduacea*, *S. californica*, *S. funerea*, and *S. Greatae*.

broadly spreading, laciniate, the laciniae white at the tips; stamens seated on the base of the lower lip, the filament practically wanting, the connectives 12–14 mm. long; style branches subequal.

The species ranges from interior Contra Costa, San Joaquin, and Stanislaus counties southeastward through the Great Valley and interior valleys of the coast ranges to Kern County and thence through the western Mojave Desert from Inyokern and Searles Station southward along the western margin of the Colorado Desert to northern Lower California, as far south, at least, as San Quintin and as far east as Barstow. Throughout this range it is associated with a variety of plants and is found usually in sandy, often disturbed soil. Its occurrence is chiefly in two formations: the coastal sage formation *(Artemisia californica-Salvia* spp.*-Eriogonum fasciculatum)* and the Sonoran formation *(Larrea mexicana-Franseria dumosa-Yucca brevifolia)*. While it is most frequently seen in the former, it seems usually to occupy disturbed ground there, as though an interloper, although I have observed it as far south as San Quintin in the *Artemisia* association growing under natural conditions. It appears to be natural to the western part of the Mojave Desert *(Larrea-Franseria)*, occurring there chiefly in sandy or gravelly soil of the valleys and in a good year frequent and abundant. It enters only into the western margin of the Colorado Desert, however. At the same time is occurs widely and sometimes in great abundance on the alluvial cones of the Great Valley. It seldom ranges above 4,000 feet. The corolla is exquisite in form and coloring, the tips of the fringe being white, the anthers lacquer-red. The odor of the foliage is pungent, suggestive of *Citronella* in which respect it is like *S. Greatae*. It belongs to that class of plants sometimes known as "winter annuals," flowering after the winter rains mostly in April, May, and June, and soon disappearing. Following are localities where the species has been found:

CALIFORNIA: CONTRA COSTA: Antioch; ALAMEDA: Corral Hollow; SAN JOAQUIN: Tracy, Calaveras R.; STANISLAUS: Knight's Ferry, Adobe Valley, Crows Landing; MADERA: Berenda; FRESNO: Coalinga; TULARE: Porterville, Visalia, Grapevine Spring, Delano, Earlimart; SAN BENITO: Panoche, San Benito; MONTEREY: Arroyo Seco, Palomar Cr., Lockwood; SAN LUIS OBISPO: Cholame, Nipomo, Pala Prieta of Bitterwater Valley; KERN: Rosamond, Bakersfield, Wasco, Lebec, Caliente, Pama Sta., Jewette, Searles, Mojave; SANTA BARBARA: Orcutt, Betteravia; LOS ANGELES: Peace Valley, Tejon Rancho, Gorman's, Lancaster, Palmdale, Pomona, Acton, Claremont; SAN BERNARDINO: Helendale, Barstow, Crofton, Hesperia;

ORANGE: Orange, Vale Verde near Galivan; RIVERSIDE: Banning, Riverside, Temecula, Colton, Winchester, Perris, Elsinore, San Jacinto Valley; SAN DIEGO: San Diego, San Felipe, Jacumba, Mason Valley; BAJA CALIFORNIA: San Quintin.

MUNZIA

Singular rounded herbs with leaves usually iliciform, sessile, sometimes entire but spine-tipped; flowers few in the axils of the upper leaves, subtended by small bractlets; calyx teeth either deltoid and subequal, obtuse or acute, or else unequal and spinose; corolla-tubes either glabrous within or sparsely pilose, not at all annulate, the middle lobe erose or laciniate, concave or plane; filaments short, both anthers perfect, the lower usually smaller (larger and included within the tube of *S. funerea).*

The habit of these shrubs is very similar to the species of *Atriplex* with which they are commonly associated. All three occur in areas where volcanic rock is present, although not usually on such rock but upon sedimentary rock associated with it. *S. funerea* and *S. Greatae* occur in gravelly washes of narrow canyons or on the sides of the canyons above such washes from about 1000 feet to 3000 feet. *S. californica* occurs in open broad gravelly washes. All are found in the *Larrea-Franseria* formation and are associated with species of *Atriplex* and *Encelia,* and two, *S. californica* and *S. Greatae,* occur in company with *Hyptis Emoryi.*

2. **S. californica** Brandegee in Proc. Calif. Acad., II, 2: 197. 1889, based upon a specimen collected by Brandegee in Baja California at "Cardon Grande" near Calmalli; the type is in the herbarium of the University of California (Berkeley).

Plate 13.

A shrub 1–2.5 m. tall, its branchlets whitened with floccose branching hairs and sprinkled with golden glands; leaf-blades .5–4 cm. long, sessile, crowded, oblong-iliciform, the teeth usually 6–9, deltoid, shortly spinose, both surfaces floccose and whitened with branched hairs; flowers 3–6 in the axils of diminished iliciform leaves, the glomerules .5–3 cm. distant; flowering calyces 4.5 mm. long, whitened with floccose branching hairs, their teeth deltoid, subequal, the three posterior

somewhat united; corolla-tubes (? white or pallid) 5–7 mm. long, the upper lip 2 mm. tall, the lower twice as long, very sparsely pilose above, the middle lobe nearly plane; stamens adnate to the base of the lower lip, the filament scarcely 1 mm. long, the connective 4–6 mm. long; style branches equal.

Found in Baja California in sandy gravelly washes with species of *Atriplex, Hyptis Emoryi, Hymenoclea Salsola, Viguiera reticulata,* and *Encelia farinosa.* It is known to occur at San Pablo, Cardon Grande near Calmalli, Lagoon Head (? Scamman's Lagoon), 10 mi. w. of Calmalli, San Gertrudis, 18 mi. w. of Punta Prieta, and Los Angeles Bay. It is known locally at Calmalli and San Gertrudis as "Salvia China." I was unable to learn the significance of the term.

3. **S. funerea** Jones, Contrib. West. Bot. 12: 71. 1908, based upon a specimen collected in Inyo Co., Calif., in the Funeral (Amargosa) Range; the type is in the herbarium of Pomona College. Plate 14.

S. funerea var. *fornacis* Jeps., Man. Calif. 868. 1925, based upon a collection made by Parish (no. 10032) in Furnace Creek, Death Valley; the type is in Jepson's herbarium.

A white shrub as much as a meter and a half tall, its branchlets densely lanate with branched hairs; leaf-blades 1.5–2 cm. long, elliptical or ovate, acuminate-spinose at the apex, frequently rounded below the middle, more commonly narrowed to petioles 2–5 mm. long, mostly entire, some usually iliciform with one or two pairs of stout spinose teeth, both surfaces ashy or white with branching hairs; flowers prevailingly 3 in the axils of usually iliciform leaves, crowded into foliose spikes 3–8 cm. long; flowering calyces very densely white-lanate with branching hairs, 4.5–6 mm. long, their teeth subequal, deltoid, the three posterior lightly joined at the base; corolla violet, its tube 9–11 mm. long, pilose within above the middle and in the palate, the upper lip 2–2.5 mm. tall, the lower twice as long; stamens seated between the middle of the tube and the throat; filaments 1.5–2.5 mm. long, the connective 1.5 mm. long; style branches equal and somewhat dilated.

General throughout narrow canyons on the western slopes

of the Amargosa Range (Granite, Funeral, and Black Mountains), ranging at least from Hole-in-the-Rock Spring to Furnace Creek, Travertine Canyon, and Ryan. It occurs in the Grapevine Mountains in Titus Canyon and in the northern part of the Panamint Mountains in Grotto and Mosaic Canyons and possibly further south. It is found from about 1000 to about 3000 feet, in the narrow canyons, both in the washes and in small gullies entering them or on narrow benches above the washes. It is an associate of the *Larrea-Franseria* formation and is most often found with *Atriplex hymenelytra, Viguiera reticulata, Encelia farinosa* or *E. Actoni,* and *Eucnide urens.*

4. S. Greatae Brandegee in Zoe **5**: 229. 1906, based upon a specimen collected in Riverside Co., Calif., in Canyon Springs Wash near Dos Palmas by Hall and Greata (no. 5848); the type is in the herbarium of the University of California (Berkeley). Plate 15.

A fragrant shrub rounded and dense, as much as a meter tall, its branchlets whitened with branching hairs, less often glandular with small spreading hairs and sprinkled with longer spreading stout ones; leaf-blades generally 2–3 cm. long, sessile, iliciform or the lowest nearly entire and elliptical, prevailingly ashy with branched hairs, sometimes more or less glandular, especially the lower becoming glabrate; flowers numerous in the axils of iliciform leaves, the glomerules mostly 3–6 cm. distant; flowering calyces 11–12 mm. long, generally incanous with branching hairs, sometimes entirely glandular, arcuate-gibbous, the lower lip 3–3.5 mm. long, the three upper teeth partly united, the posterior one twice as long as the lateral ones, all spinose; corolla rose, its tube 9–11 mm. long, the upper lip 2–2.5 mm. tall, the lower almost twice as long, very sparingly pilose on the upper surface, the middle lobe lightly cupped; stamens seated nearly in the throat, the filament 1 mm. long, the connective 2.5 mm. long; style branches equal.

This species is known only from the Orocopia Mountains where it occurs in a canyon near Dos Palmas (east of Mecca, California), Salt Creek Wash, and in the narrow canyons behind Hidden Spring, ranging from about 500 feet elevation. In the canyon bottom it occurs in loose gravel and rocks in the

Larrea-Franseria formation with *Hyptis Emoryi, Bebbia juncea, Cercidium Torreyanum, Peucephyllum Schottii, Acacia Greggii,* and *Encelia farinosa;* on the sides of the canyon above the wash its principal associate is *Encelia farinosa.* Like *S. Vaseyi* the corolla-tube is vertically compressed in the throat. It is not improbable that the species will be found in other canyons in the Orocopia Mountains.

Subsect. Pycnosphace

Pycnosphace Benth., Lab. Gen. et Sp. 302. 1833, as section, based upon *S. Columbariae;* Rydb., Fl. Rocky Mts. 747. 1917, as genus.

Singular annual herbs with pinnatifid hispidulous leaves; flowers many in compact usually capitate sometimes remotely moniliform glomerules, subtended by spine-tipped rotund bracts; upper calyx teeth completely joined, provided with two or sometimes three spines at the tip, the lower free, spinose; corolla-tube glabrous; stamens seated toward the throat, the long arm of the connective ascending under the upper lip, somewhat surpassing it, the shorter deflexed, both anthers perfect, the lower smaller.

One species.....*5. S. Columbariae*

5. S. Columbariae Benth., Lab. Gen. et Sp. 302. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Plate 16.

Pycnosphace Columbariae Rydb., Fl. Rocky Mts. 747. 1917.

A singular annual herb 3–4 cm. tall in drouth forms, or 30–50 cm. tall in robust forms, their flowering stems one or more, mostly retrorse-hispidulous, frequently sprinkled with longer thick hairs; leaves mostly basal, with usually one or two cauline pairs, pinnatifid, oblong-ovate in outline, their lobes crenate or again rounded-lobed, both surfaces more or less hispidulous, the upper bullulate, the lowermost borne on subequal petioles, the upper sessile or nearly so; flowers many in glomerules either solitary or sometimes 2–3, these subtended by

overlapping rotund colored bracts, glabrous or hispidulous, ciliate, notched, provided with a spine in the notch; flowering calyces mostly 8–10 mm. long, hispidulous, more or less glandular, arcuate-gibbous, bearded on the hump with long thickened

Fig. 2. Showing distribution of *S. Columbariae*.

hairs, the teeth of the lower lip 2.5–3 mm. long, all spinose, the teeth of the upper lip wholly joined save for the spines, the middle one of which is usually suppressed; corolla clear blue, its tube mostly 7–8 mm. long, glabrous within, the upper lip

2.5–3 mm. tall, the lower about twice as long, entire; stamens seated in the throat, the filament about 1.5 mm. long, the connective about 2.5 mm. long; posterior style branch mostly half as long as the anterior, or less.

An ubiquitous vernal plant in southern California, most variable in stature, occupying dry, often disturbed soil, in association with the chaparral, the coastal sage, the Great Basin microphyll or Sonoran Desert formations. Found usually below 4000 feet, but may occur at least as high as 7000 feet. Ranges from Glenn and Butte counties southward through the coast ranges into Baja California as far south as Cedros Island, southeastward from Tuolumne and Stanislaus counties throughout southern California, through Nevada (Washoe, Mineral, Nye, Lincoln and Clark counties) to Washington County, Utah, through western and southern Arizona (Mohave, Maricopa, Pima, Gila, and Cochise counties) into northern Sonora. It is known to occur on Santa Catalina and San Clemente Islands and perhaps upon the other coastal islands as well. Throughout this range the species is remarkably constant, save for variability in stature due to water supply during growth.

Subsect. Greeneostachys

Stout viscid perennial herbs with creeping rootstocks, the flowering stems ascending; leaves ample, deltoid-oblong or hastate, borne on marginate or winged petioles; flowers many in large viscid glomerules disposed in stout moniliform spikes, subtended by colored appressed bracts; upper calyx teeth wholly joined to a gibbous lip, the two lower small, free; corolla-tube glabrous; stamens ascending under the upper lip and exceeding it, the lower part of the connective half as long as the upper or less, the lower anther usually suppressed, rarely vestigial.

One species.....*6. S. spathacea*

6. S. spathacea Greene in Pittonia 2: 236. 1892, based upon *Audibertia grandiflora* Benth., loc. cit. (not *S. grandiflora* Etling). Plate 17.

Audibertia decurrens Nutt. ex Benth. in DC. Prodr. 12: 359. 1848 (an herbarium name cited in synonomy).

Audibertia grandiflora Benth., Lab. Gen. et Sp. 312. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella grandiflora Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon *Audibertia grandiflora* Benth., loc. cit.

Ramona grandiflora Briq., loc. cit., 440. 1894, based upon *Audibertia grandiflora* Benth., loc. cit.

A perennial herb with creeping rhizomes, frequently forming mat-like clumps, its annual stem usually solitary, stout, ascending usually 0.5–1 m., viscid-pilose throughout with spreading hairs; leaves approximate toward the base, the blades prevailingly oblong-hastate, 8–20 cm. long, obtuse, truncate-subhastate at the base, irregularly crenate, rarely somewhat lobed, the upper surfaces bullulate, sparingly viscid-pilose, the lower ashy-tomentose or glabrate, borne on petioles mostly 3–8 cm. long, these margined or winged and clasping at the base; flowers numerous in glomerules 3–6 cm. distant, disposed in coarse viscid interrupted spikes 20–30 cm. long or more, subtended by numerous ovate or elliptical viscid appressed acuminate bracts, usually purplish; flowering calyces 22–30 mm. long, viscid-pilose, hispidulous within, the teeth of the lower lip 2–4 mm. long, weakly spinose, cut between them to a depth of 8–12 mm., the teeth of the upper lip wholly connate, rarely trimucronate at the tip; corolla crimson, its tube glabrous within, 25–35 mm. long, narrowed below the middle, the upper lip 7–8 mm. tall, the lower somewhat longer; stamens seated between the middle of the tube and the throat, ascending under the upper lip, their filaments equal to the tube, the connective 10–15 mm. long, the lower anther sometimes somewhat polliniferous; posterior style branch shorter, of varying length.

Ranges from Solano County near Vacaville southward in the coastal counties to Orange County, although apparently never collected in Alameda County. It is infrequent although

locally abundant, associated chiefly with the valley woodland formation *(Quercus agrifolia, Q. Douglasii, Q. lobata, Q. Wislizeni)*, occurring on open slopes though usually in partial shade of other species, especially *Quercus agrifolia.* It may

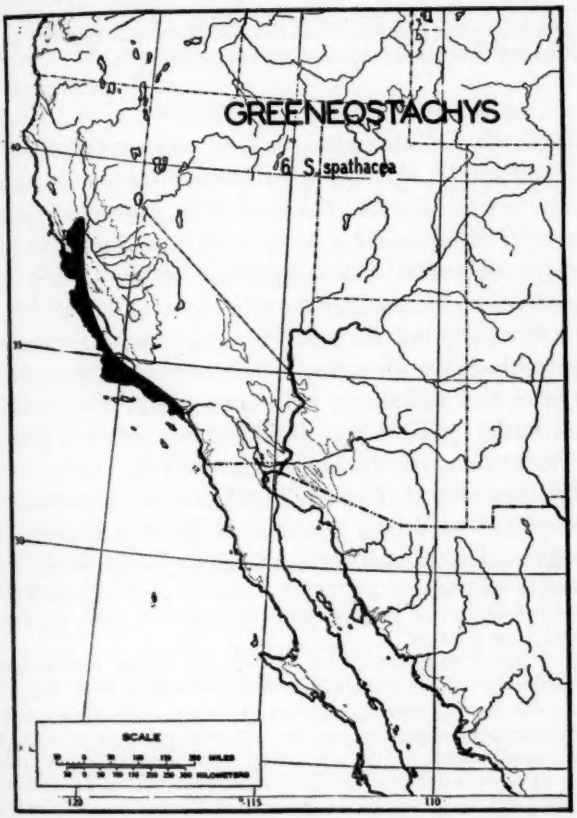

Fig. 3. Showing distribution of *S. spathacea.*

grow near *Salvia mellifera, apiana, leucophylla,* and *Columbariae,* but I have never seen it growing actually with any of these species, nor have I seen any suggestion of a hybrid form. Following are localities where it is known to occur:

CALIFORNIA: SOLANO: Vacaville; CONTRA COSTA: Pine Canyon, foot of Mt. Diablo; SAN MATEO: San Bruno Hills, Colma; MONTEREY: Tassajara Hot Springs, Morro Cr., Santa Lucia Mts.; SAN LUIS OBISPO: Paso Robles, Atascadero, Cambria, San Luis, Morro; SANTA BARBARA: Surf, Santa Maria, Mission Canyon near Santa Barbara, Cuyama Canyon, Montecito, San Isidro Ranch, Zaca Lake Forest Reserve, Carpenteria, Gaviota Pass; VENTURA: Foster Park, Ojai Cr.; LOS ANGELES: Los Alisos, Los Flores, Mandeville and Topanga Canyons of Santa Monica Mts., Pasadena, Calabasas, Pacific Palisades, Mint Canyon, Mulholland Highway in Bel Air; ORANGE: Laguna, Santa Ana Canyon (Aliso Canyon).

Subsect. PARISHIELLA

Shrubs with bullate-rugose leaves, oblong-elliptical or obovate, even linear, the upper surfaces glabrous or hirtellous, green, the lower ashy or whitened with appressed hairs, one species with branched hairs; flowers numerous in compact glomerules subtended by appressed often weakly spinose bracts, disposed in moniliform spikes, often branched; upper calyx teeth wholly united, usually trimucronate, the lower free, shortly spinose; corolla-tubes either narrowly pilose-annulate within near the middle or pubescent above the middle; the stamens seated in the throat, the filaments scarcely if at all exserted from the tube, the anthers ascending under the upper lip, but little or not at all exceeding it, entirely concealed within the tube of *S. Brandegei;* posterior style branch shorter.

Leaves linear, revolute, whitened below with branched hairs; stamens wholly included in the tube.....*9. S. Brandegei*

Leaves oblong-elliptical or obovate, appressed pubescent beneath; stamens exserted from the tube.

Connectives somewhat exserted from the tube, the anthers somewhat exceeding the upper lip; leaves oblong-elliptical, prevailingly 3–6 cm. long.....*7. S. mellifera*

Connectives included within the tube, the anthers shorter than the upper lip; leaf-blades prevailingly 12–15 mm. long, rarely as much as 4 cm., mostly obovate or oblanceolate.....*8. S. Munzii*

7. S. mellifera Greene in Pittonia 2: 236. 1892, based upon *Audibertia stachyoides* Benth., loc. cit. (not *S. stachyoides* Kunth). Plate 18.

Audibertia stachyoides Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

S. mellifera var. *typica* Munz in Bull. S. Calif. Acad. Sci. **26**: 24. 1927, based upon the same.

Audibertia spinulosa Nutt. ex Benth. in DC., Prodr. **12**: 359. 1848 (an herbarium name cited in synonomy).

Audibertiella stachyoides Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the preceding.

Ramona stachyoides Briq., loc. cit., 440. 1894, based upon the same.

A shrub 1–2 m. tall, its branchlets pubescent with usually retrorse hairs, sometimes villous, more or less glandular; leaf-blades prevailingly 3–6 cm. long, oblong-elliptical, obtuse at the apex, narrowed below the middle to more or less margined petioles 3–12 mm. long, the upper surfaces bullate, green, glabrate or hirtellous, the lower ashy, less often whitened by appressed hairs, areolate, the margins crenulate, flowers many in compact glomerules prevailingly 2–4 cm. in diameter including the flowers, subtended by ovate bracts, reflexed at maturity, hirtellous or villous, more or less glandular, either acuminate or shortly spinose, disposed in moniliform spikes, usually panicled, mostly 2–6 cm. distant; flowering calyces 5.5–7 mm. long, villous and more or less glandular, hispidulous within, the lower teeth free, 1.5–2 mm. long, ovate, acuminate-spinose, those of the upper lip joined to the apex, muticate or (usually) trimucronate, rarely shortly tridentate; corolla pale blue or tinged with rose, or whitish, its tube 5.5–9 mm. long, mostly about 9 mm., narrowly and transversely annulate near the middle, the upper lip 2.5–3 mm. tall, retuse, the lower twice as long, its middle lip cupped; stamens ascending under the upper lip, seated within the throat, exserted from the corolla-tube 3–4 mm., the connective and filament subequal.

This species is one of the principal shrubs of the coastal sage formation (*Artemisia californica, S. mellifera, S. apiana, S. leucophylla, Rhus laurina, Rhus integrifolia*), ranging from the Bay region to a point somewhat south of Tijuana. Southward from San Diego County its place in the formation is assumed by *S. Munzii*. As far as I know, the two species do not grow together, but both occur frequently with *S. apiana*. *S. mellifera*

occurs also with *S. leucophylla, S. Columbariae* and, infrequently, *S. Clevelandii* and *S. carduacea.* Hybrids are common with *S. apiana* and *S. leucophylla,* occasional with *S. Co-*

Fig. 4. Showing distribution of *S. mellifera, S. Munzii,* and *S. Brandegei.*

lumbariae and not recorded for *S. carduacea* or *S. Clevelandii.* The inflorescence of the coastal forms tends to be more branched and elongate than those of the interior, the flowers bluer, and the plant less compact. The last flowers of the sea-

son may simulate the flowers of *Salvia Munzii* in the reduced and included stamens.

The species ranges more or less continuously from Contra Costa, Alameda, western Stanislaus, and Santa Clara counties southward along the coast, extending into the interior coastal valleys, but apparently not into the Great Valley, to southern California. Here it is one of the most abundant species of the coast ranges and the lower parts of the Sierra, extending inland as far as Cajon Pass and the San Jacinto Mountains and southward through San Diego County west of the divide, into northern Lower California where it is soon replaced by *S. Munzii*. It occurs also on Santa Cruz and Catalina Islands. During the severe winter of 1936-37 occasional plants in the Santa Monica Mountains were frozen back. The species regenerates after fire chiefly by seedlings. It reaches its greatest development on low foothills, as in the Santa Monica Mountains. As the name suggests, it is an important bee plant.

8. **S. Munzii** Epl. in Madroño **3**: 169. 1935, based upon a specimen collected by Epling and Robison in a small arroyo south of the Hamilton Ranch, Lower California; the type is in the herbarium of the University of California (Los Angeles). Plate 19.

S. mellifera var. *Jonesii* Munz in Bull. S. Calif. Acad. Sci. **26**: 24. 1927, based upon a specimen collected in Lower California near Ensenada, by Jones (10. IV. 1882); the type is in the herbarium of Pomona College.

A rounded handsome shrub as much as 2.5 m. tall with branchlets appressed-hispidulous; leaf-blades primarily obovate-oblong, prevailingly 12–40 mm. long, rounded at the apex, narrowed below the middle to petioles 1–3 mm. long, frequently sessile, the upper surface bullulate, hirtellous, the lower clothed with minute appressed hairs, both ashy, their margins crenulate; flowers few in glomerules 10–15 mm. in diameter, subtended by usually oblong-elliptical appressed bracts about equal to the calyces, acute or shortly aristate, ciliolate and for the rest nearly glabrous, disposed in slender unbranched or sometimes ternate moniliform spikes; flowering calyces 4.5–6

mm. long, hirtellous, more or less glandular, the lower teeth free, 1.5–2 cm. long, subaristate, the upper completely joined and usually obscurely trimucronate; corolla clear blue, its tube 7–9.5 mm. long, puberulent within above the middle but hardly annulate, the upper lip 2–2.5 mm. tall, retuse, the lower twice as long; stamens seated about midway between the middle of the tube and the throat, shorter than the upper lip, the connective and filament subequal.

Ranges from San Miguel Mountain in San Diego County, at least as far south as Rosario, Baja California, and about 25 miles inland from that point, apparently falling within the range of *Rhus laurina*. It ranges from sea-level to perhaps 4000 feet, entering the *Idria* belt in Lower California. North of Ensenada, at least along the coast, it is spasmodic in occurrence. Southward it becomes more abundant, and in the vicinity of San Antonio Canyon is, with *Artemisia californica*, a codominant of the coastal sage formation. Its most constant associate throughout its range is *Artemisia californica*. In odor it more nearly resembles *S. Clevelandii* which it also resembles in foliage. It may be readily distinguished from *S. mellifera* by its more compact rounded habit, the usually unbranched inflorescence, the more obovate leaves, and particularly by the conformation of the corolla and stamens which are sometimes scarcely exserted from the corolla-tube. Its corollas are uniformly a darker blue than those of *S. mellifera*, rarely approaching it in color. Its flowering period is notably earlier than that of *S. mellifera*, it being in full flower throughout its range in the first part of February, 1935. While *S. mellifera* ranges south of Tijuana, I have not yet found the two growing together. I believe that *S. Munzii* in the northern part of its range occurs at higher elevations than *S. mellifera*. The species occurs near or perhaps with *S. Clevelandii* on San Antonio Mesa, Baja California, but no hybrids have thus far been observed. It occurs frequently with *S. apiana*.

Following are specific localities where the species is known to occur:

California: San Diego: San Miguel Mt., 2½ mi. s. e. of Sunnyside.
Baja California: 18 mi. n. of Ensenada, Salitre near Johnson Ranch, San An-

tonio Mesa and Canyon, La Grulla Gun Club, Arroyo Seco between San Rafael and San Antonio Mesa, San Telmo Abajo, San Rafael Valley, Rosario, 25 mi. e. of Rosario, Hamilton Ranch, Santa Clara Canyon, San Quintin, San Vicente Canyon, Ensenada, Las Salinas (? near S. Quintin), Cariso Cr., Las Animas Canyon between Ensenada and Santo Tomas.

9. **S. Brandegei** Munz in Bull. S. Calif. Acad Sci. **31**: 69. 1932, based upon *Audibertia stachyoides* var. *revoluta* Brandegee, loc. cit. Plate 20.

Audibertia stachyoides var. *revoluta* Brandegee in Proc. Calif. Acad. II, 1: 216. 1888, based upon a specimen collected on Santa Rosa Island, Calif., by Brandegee; the type is in the herbarium of the University of California (Berkeley).

S. mellifera var. *revoluta* Munz in Bull. S. Calif. Acad. Sci. **26**: 23. 1927, based upon the same.

A shrub 1 m. tall or more, its branchlets pubescent with branching hairs; leaf-blades linear, prevailingly 2–4 cm. long, 2–5 mm. wide, obtuse, subsessile, their margins crenulate, revolute, the upper surfaces bullate, glabrous, green, the lower white-tomentose with branched and simple hairs; flowers few in glomerules 1.5–2 cm. in diameter, disposed in moniliform spikes, 1–3 cm. distant, subtended by ovate bracts shorter than the calyces, villous with branching hairs; flowering calyces 7–8 mm. long, villous with branching hairs, the teeth of the lower lip free, 1.5 mm. long, shortly spinose, the three posterior wholly joined except for the apex where trimucronate, 3.5–4 mm. tall; corolla lavender, almost rose-color, its tube 7–8 mm. long, pubescent within above the middle, hardly annulate, the lobes of the upper lip 3–3.5 mm. tall, joined almost to the apex, the middle lobe of the lower lip 3–4 mm. long, obcordate; stamens singular, the connective and filament together subequal to the anther, seated between the middle of the tube and the throat and wholly included within the tube; style shortly exserted.

This species occurs only on Santa Rosa Island, apparently playing the same rôle there in the coastal sage formation that *S. mellifera* and *S. Munzii* do on the mainland. While its principal associates there are *Artemisia californica* and *Rhus in-*

tegrifolia, its normal range is difficult to determine because of the profound modification of the original vegetation of the island through grazing and its replacement by introduced grasses. At present *S. Brandegei* occurs on the walls of a few of the steeper canyons, apparently on both sides of the island, ranging from sea-level to approximately 800 feet, entering (with *Artemisia californica)* into the chaparral belt (quercetal-chamisal). While *Artemisia californica* occurs elsewhere in small patches, due to the protection of *Opuntia,* it is not apparently accompanied by the *Salvia.*

Subsect. Jepsonia

Shrubs of varied habit or *(S. sonomensis)* suffrutescent prostrate herbs, of interest to the botanist not only by reason of the morphology of leaf and flower but because of their part in plant economy; leaves varied, now deltoid now oblong-elliptical or obovate, rarely *(S. leucophylla)* clothed with branched hairs; posterior calyx teeth wholly joined unless trimucronate or even aristate at the apex, the two inferior free, mostly acute, rarely spinose, even aristate (those of *S. leucophylla* wholly joined to the upper lip, the orifice accordingly oblique and truncate); corolla-tube more commonly pilose-annulate near the middle, less often pubescent usually above the middle; stamens seated either in the tube near the throat or on the base of the lower lip, thrust out from the tube or even declined on the lower lip, the connective and filament subequal, the whole clearly much longer than the upper lip, the lower arm of the former wholly suppressed, the articulation oblique and inconspicuous; style usually declined, the posterior branch shorter.

Perennial suffrutescent prostrate herbs.....*16. S. sonomensis*
Erect shrubs.
  Hairs branched; calyx teeth wholly united, the orifice therefore entire, oblique .....*11. S. leucophylla*
  Hairs simple; lower calyx teeth free.
    Leaf-blades entire, obovate, oblanceolate or spatulate, similarly clothed on both sides with minute appressed hairs.
      Corolla-tubes pubescent above the middle, scarcely annulate, 5–10 mm. long; calyces 5–7 mm. long.....*14. S. carnosa*

Corolla-tubes more or less pubescent above the middle, strongly pilose-annulate below, 15–22 mm. long; calyces 8–13 mm. long.....
.....*13. S. pachyphylla*

Leaf-blades crenulate, sometimes obovate, mostly deltoid-oblong or oblong-elliptical, similarly clothed on both surfaces with minute hairs in two species but these leaves not obovate.

Leaves similarly clothed on both surfaces with minute appressed hairs, very white, the upper surface not bullate-rugose.

Leaves truncate or abruptly cuneate at the base; corolla-tubes 11–14 mm. long.....*17 S. Vaseyi*

Leaves narrowed at the base; corolla tubes 5–7 mm. long.....*18. S. apiana*

Leaves bullate-rugose on the upper surfaces, green, the lower surfaces hispidulous or ashy with appressed hairs.

Leaves narrowed below the middle, elliptical-oblong or obovate, the lower surfaces ashy with appressed hairs; lower lip of corolla shorter than the upper.....*10. S. Clevelandii*

Leaves tending to be deltoid, the lower surfaces hispidulous, green; lower lip of corolla longer than the upper.

Middle lobe of the lower lip entire, about 3–4 mm. long.....
.....*12. S. mohavensis*

Middle lobe of the lower lip erose, furcate, about 5–6 mm. long.....
.....*15. S. eremostachya*

10. S. Clevelandii Greene in Pittonia **2**: 236, 1892, based upon *Audibertia Clevelandii* Gray, loc. cit. Plate 21.

Audibertia Clevelandii Gray in Proc. Am. Acad. **10**: 76. 1874, based upon a specimen collected near Potrero, San Diego Co., by Cleveland; the type is in the Gray Herbarium.

Audibertiella Clevelandii Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the same.

Ramona Clevelandii Briq., loc. cit., 440. 1894, based upon the same.

A fragrant pretty shrub as much as a meter tall, its branchlets pubescent with retrorse hairs, ashy; leaf-blades 1.5–2.5 cm. long, usually elliptical, frequently obovate, obtuse at the apex, narrowed at the base to petioles 3–6 mm. long, their margins crenulate, the upper surfaces bullulate, hirtellous, the lower ashy or, especially when young, whitened with minute appressed hairs, areolate with prominent veins; flowers many in compact glomerules which are solitary, or two or three in remotely interrupted spikes, these even branched, subtended by firm ovate bracts shorter than the calyces, glandular-hispidu-

lous or the outer hirtellous; flowering calyces 8–10 mm. long, glandular-hispidulous, the teeth of the lower lip free, 1–1.5 mm. long, shortly spinose, the upper wholly joined unless trimucronate at the apex, 3.5–4 mm. tall; corolla dark violet-blue, its

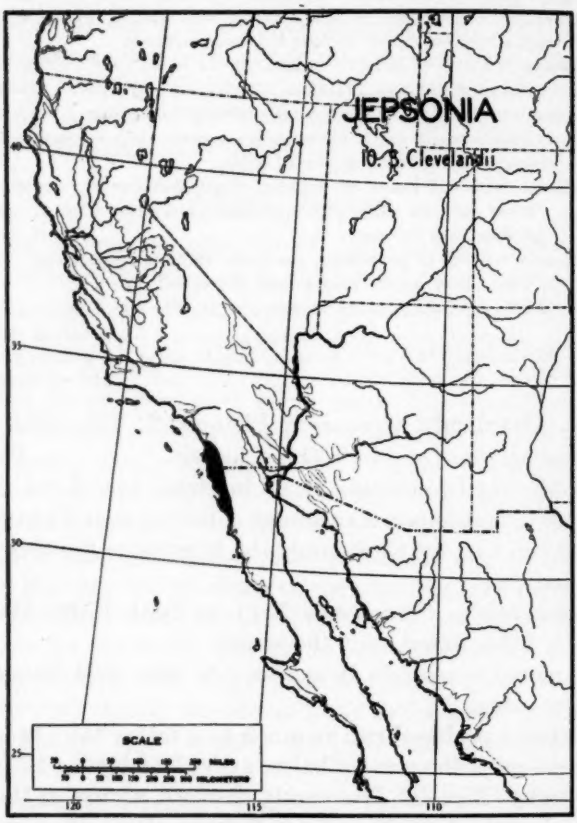

Fig. 5. Showing distribution of *S. Clevelandii*.

tube 12–18 mm. long, arcuate, transversely pilose-annulate below the middle, the lobes of the upper lip almost wholly united, 6–8 mm. tall, the middle lobe of the lower lip mostly oblong, 3–4 mm. long, plane, retuse, otherwise entire; stamens seated toward the throat, the connective and filament subequal.

This species is a component of the chaparral of western San Diego County, extending from the vicinity of Lake Henshaw southward to San Antonio Mesa, Baja California, from sea-level to about 3000 feet. It occurs most commonly with the chamise, *Adenostoma fasciculatum,* and *Ceanothus* spp., but frequently is found with species of the coastal sage formation: *Salvia mellifera, S. apiana, Rhamnus crocea, Cneoridium dumosum.* Hybrids are known with *S. apiana (S. Palmeri).* The foliage is fragrant with a sweetish sage-like odor, noticeable en masse in the open or when dry in the herbarium, persisting for long periods. Occasional albino heads occur.

Following are specific localities where the plant is known to grow:

CALIFORNIA: SAN DIEGO: Flinn Springs, Mt. Woodson, Otay Mt., Alpine, Palomar Mt., Henshaw Dam, between Ramona and Ballena, Tecate R., Del Mar, Moreno Grade, Japatul Valley, Torrey Pines Park, Descanso, Cottonwood Grade near Potrero, Palomar Mt., Laguna Mts., Valley Center, Soledad R., 2½ mi. south of Tenaja Guard Station on road to Santa Margarita.

BAJA CALIFORNIA: Tecate R., 30 mi. south of Tijuana, San Antonio Mesa at head of San Antonio Canyon. (This latter point marks the southern limit of the chamisal, as far as I have been able to observe.)

11. S. leucophylla Greene in Pittonia **2**: 236. 1892, based upon *Audibertia nivea* Benth., loc. cit. (not *S. nivea* Thunb.).

Plate 22.

Audibertia nivea Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected by Douglas in California; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella nivea Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the preceding.

Ramona nivea Briq., loc. cit., 440. 1894, based upon the same.

A handsome whitened shrub as much as 1.5 m. tall or more, its branchlets incanous with very minute branched hairs; leaf-blades deltoid-oblong, prevailingly 3–6 cm. long, rounded at the apex, usually truncate at the base, or narrowed in the smaller ones, borne on more or less margined petioles 3–8 mm. long, their margins crenulate, the upper surfaces bullulate, both surfaces, especially the lower, ashy or whitened with very

small branched hairs; flowers many in compact glomerules subtended by whitened ovate-elliptical appressed bracts equal to the calyces, arranged in stout moniliform spikes, 3–6 cm. distant; flowering calyces mostly 8–11 mm. long, whitened with

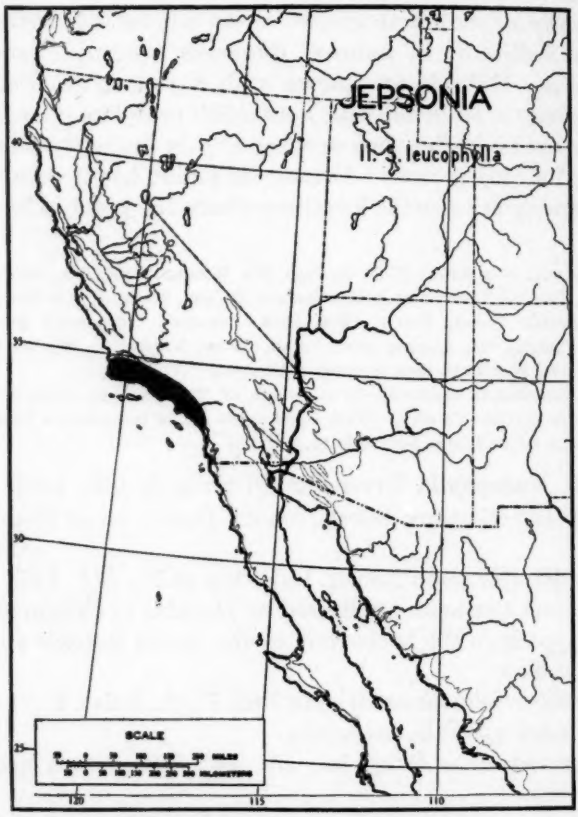

Fig. 6. Showing distribution of *S. leucophylla*.

minute branched hairs, the teeth wholly united into a single cucullate lip, the lower part sometimes barely evident, the orifice strongly oblique; corolla rose-color, rarely tending to bluish, its tube 10–13 mm. long, strongly pilose-annulate above the middle, the upper lip 6–8 mm. tall, oblong, its lobes free in the

upper part, the middle lobe of the lower lip oblong, plane, 4–5 mm. long; stamens seated in the throat, the connective shorter than the filament.

This species is a component of and an important member of the sage formation within its range. It occurs with *S. mellifera* and frequently with *S. apiana*, but often in pure and even dense stands, forming a close-cropped gray mantle of velvety texture over the rounded coastal hills. It is unique in the section by reason of the branched pubescence, the truncate calyx, and the conformation of the corolla. It is a noteworthy bee plant.

Following are localities where it is known to occur:

CALIFORNIA: SAN LUIS OBISPO: Pismo Beach, San Luis Obispo; SANTA BARBARA: Santa Inez Mts., between Zaca Lake and Los Olivos, Mission Ridge (Santa Barbara), Lompoc (Salsipuedes Canyon), Montecito, Cuyama Cañon; KERN: Lebec; VENTURA: Fillmore, Santa Paula, below Mutau Flat, Piru Cr., Sulfur Mt. near Ojai, Sespe Cr.; LOS ANGELES: Los Alisos Canyon near Santa Monica, Girard, Malibu Hills, Calabasas, Bouquet Canyon, San Francisquito Canyon, Pico Canyon near Newhall, Castaic, Topanga Canyon (intermixed with both *S. mellifera* and *S. apiana*), Pt. Dume, Puente Hills; SAN BERNARDINO: Chino Hills; ORANGE: Santa Ana Canyon, Black Star Canyon, Santiago Canyon.

12. S. mohavensis Greene in Pittonia **2**: 235. 1892, based upon *Audibertia capitata* Gray, loc. cit. (not *S. capitata* Schlecht.). Plate 23.

Audibertia capitata Gray in Proc. Am. Acad. **7**: 387. 1868, based upon a specimen collected in San Bernardino Co., Calif., in the Providence Mts., by Cooper; the type is in the Gray Herbarium.

Audibertiella capitata Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia capitata* Gray, loc. cit.

Ramona capitata Briq., loc. cit. 440. 1894, based upon *Audibertia capitata* Gray, loc. cit.

A low rounded shrub as much as a meter or more tall, but commonly less, its branchlets hispidulous; leaf-blades prevailingly 1.5–2 cm. long, for the most part deltoid, sometimes narrowly so or oblong-elliptical, obtuse, truncate at the base or narrowed to petioles 5–8 mm. long, their margins crenulate, the upper surfaces bullulate, the lower reticulately veined, both more or less hispidulous and sprinkled with sessile glands; flowers few in a loose subglobose head, subtended by submem-

braneous bracts, the outer ovate, the inner linear, all usually whitish; flowering calyces 7–12 mm. long, hirtellous, ciliate, more or less glandular, the teeth of the lower lip nearly free, usually ovate, acuminate, 1–2 mm. long, those of the upper com-

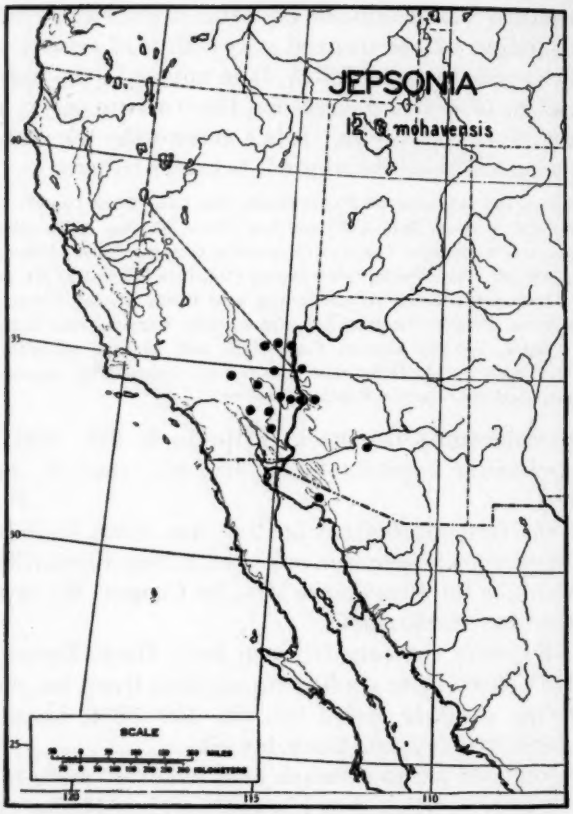

Fig. 7. Showing distribution of *S. mohavensis*.

pletely joined unless weakly trimucronate at the apex, 2.5–3.5 mm. tall; corolla pale blue or lavender, its tube slender, flaring near the throat, pubescent within above the middle, the lobes of the upper lip joined to the middle, 3.5 mm. tall, the

middle lobe of the lower subequal, nearly plane, entire; stamens seated in the throat, the connective somewhat shorter than the filament, the joint obvious; upper style branch shorter.

This species ranges from the Little San Bernardino Mountains near Lost Horse Well and Keyes Lookout through eastern San Bernardino and Riverside counties to Pinacate Mt., Sonora. In California it is known from the Little San Bernardino, Sheep Hole, Providence, Old Woman, Whipple, Old Dad, Eagle, Ord, Turtle, Clark, and Newberry Mountains. In Nevada it is known from Clark County: Good Springs, Meca Spring, and Eldorado Canyon near Nelson. In Arizona it is known from the Black Ute Mts. (Battleship Rock), the Chimehuevis Mts., and the Sierra Estrella. In Sonora it is known only from Pinacate Mt. It occurs in the upper part of the *Larrea-Franseria* formation, verging toward the piñon-juniper belt. It is found especially in rocky places and on steep rocky canyon walls.

13. S. pachyphylla Epl. ex Munz, Man. So. Calif. Bot. 445. 1935, based upon *Audibertia incana* var. *pachystachya* Gray, loc. cit. (not *S. pachystachya* Trautv.). Plate 24.

Audibertia incana var. *pachystachya* Gray, Syn. Fl. N. Am., ed. 2, **2**, pt. 1: 461. 1886, based upon a specimen collected in California in Bear Valley in the San Bernardino Mts., by the Parish brothers (no. 330); the type is in the Gray Herbarium.

Audibertia pachystachya Parish in Erythea **6**: 91. 1898, based upon the above.

Ramona pachystachya Heller in Muhlenbergia **1**: 4. 1900, based upon the same.

S. carnosa var. *compacta* Hall in Univ. Calif. Publ. Bot. **1**: 111. 1902, based upon *Audibertia incana* var. *pachystachya* Gray, loc. cit.

S. compacta Munz in Bull. S. Calif. Acad. Sci. **26**: 22. 1927, based upon *S. carnosa* var. *compacta* Hall, loc. cit. (not *S. compacta* Kuntze).

A low compact rounded shrub, woody at the base, 30–50 cm. tall, as much as a meter in diameter, its branches sprawling or

ascending, its branchlets scurfy-puberulent, whitened; leaf-blades prevailingly 2–3 cm. long, obovate, rounded at the apex, narrowed at the base to petioles 5–15 mm. long, their margins entire, both surfaces whitened with minute appressed hairs

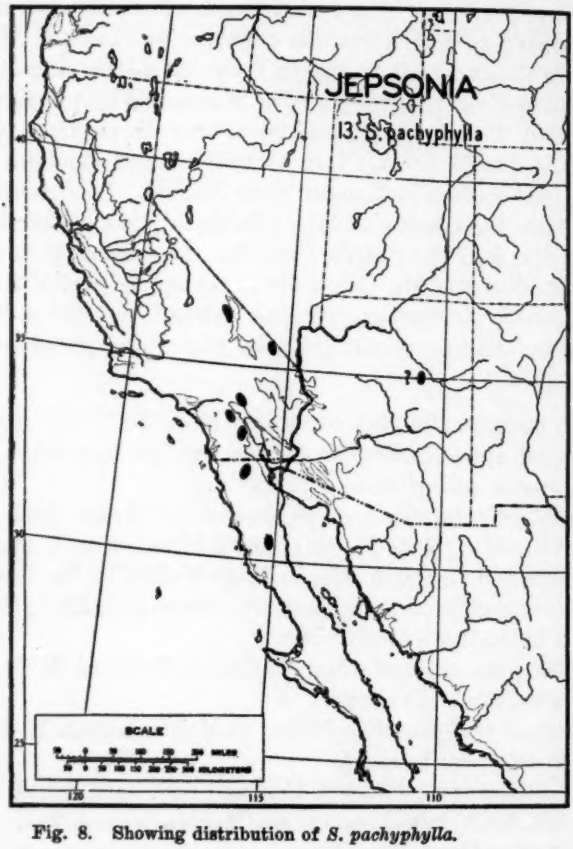

Fig. 8. Showing distribution of *S. pachyphylla.*

especially in youth; flowers several in sufficiently dense glomerules disposed usually in a compact spike 5–10 cm. long, 4–5 cm. broad, less often interrupted, 2–5 cm. distant, subtended by showy usually purple bracts mostly 1–2 cm. long, as much as 3 cm., obovate or oblong, usually rounded-truncate at the apex,

more or less ciliate on the margins, for the rest either glabrous and somewhat shining or hirtellous, hardly pilose; flowering calyces nearly cylindrical, 8–13 mm. long, pubescent, hispidulous within, the teeth of the lower lip 1–3 mm. long, mostly deltoid, acute, sometimes weakly spinose, nearly free, those of the upper lip entirely joined, 3–6 mm. tall, the lip truncate, rarely somewhat retuse; corolla dark violet-blue, rarely rose-color, its tube 15–22 mm. long, cylindrical, pubescent within above the middle, densely and transversely pilose-annulate below, the lobes of the upper lip 4–6 mm. tall, joined to the middle, the middle lobe of the lower erose, emarginate; stamens seated in the throat, the connective equalling the filament, the joint sufficiently obvious; posterior style branch shorter.

This species ranges widely but is localized. In the Panamint Mts. it occurs frequently and even abundantly in the *Juniperus utahensis-Pinus monophylla* formation or even below this, ranging from about 5000 feet in Emigrant Canyon to 10,000 feet or more at the saddle near Eagle Spring on Telescope Peak. Here it enters the zone occupied by *Pinus aristata* and *P. flexilis*. It is known from Towne Pass, Upper Wild Rose Canyon, Upper Hanaupah Canyon, and Telescope Peak. In the San Bernardino, San Jacinto, and Santa Rosa Mountains it lies chiefly in the more arid yellow pine belt, ranging into the juniper and piñon belt. In the San Bernardino Mountains it is known from Seven Oaks, Upper Santa Ana Canyon, top of Cushenberry Grade, Holcomb Valley, 2 mi. e. of Fawnskin, Upper Fish Cr., Cactus Flat, Quail Springs, Black Rock Canyon near Warren's Well, north slope of Sugar Loaf Mt., Bear Valley, Johnson Grade below Baldwin Lake, Big Meadows, Brown's Flats. In the San Jacinto Mountains it is known from the vicinity of Tauquitz Valley and Hidden Lake, and from the north side of San Jacinto Peak. In the Santa Rosa Mountains it is known from the vicinity of Santa Rosa and near Vandeventer Flat. It has recently been found by Wolf at Pachalka Spring and on the north side of the main peak of Clark Mt. In Lower California it occurs with yellow pine, as far as recorded, between Ojos Negros and Neji Rancho, and in the San Pedro Martir at La Grulla, La Encantada, and Vallecitos. I have ob-

served the species growing with *S. carnosa* in Wild Rose Canyon and on Cactus Flat, but due presumably to the difference in flowering period, no hybrids are formed. It evidently occurs with *Salvia apiana* in the Santa Rosa Mountains. *Artemisia tridentata* is an associate in the Panamint, San Bernardino, and San Jacinto Mts. A specimen collected by Marcus Jones in 1929 is said to have been obtained at the crater near Winslow, Arizona. This extension of range should be verified.

14. S. carnosa Dougl. ex Benth. in Bot. Reg. **17**: *t. 1469*. 1831, based upon a specimen collected by Douglas "on clayey banks of the Columbia and plains from Walla Walla to Spokane and on the south to the Sources of the Missouri"; the type is in the herbarium of the Royal Botanic Gardens at Kew.

A small erect shrub 30–70 cm. tall, its branchlets scurfy-puberulent, often whitened, sometimes pilose with spreading hairs in the inflorescence; leaf-blades prevailingly 1–2 cm. long, rarely 3–4 cm., oblanceolate or even linear or rotund, mostly obovate, rounded or retuse at the apex, narrowed at the base to petioles mostly 5–8 mm. long, entire, both surfaces silvery with a minute close puberulence especially when young; flowers many in sufficiently dense glomerules, disposed in short interrupted spikes, usually moniliform, less often congested, subtended by ovate-rotund usually colored bracts, these ciliate, puberulent or nearly glabrous, sometimes pilose, sometimes entirely glabrous, venulose and somewhat shining; flowering calyces turbinate, thin, hirtellous or pilose, usually ciliate, hispidulous within, the teeth of the lower lip nearly free, ovate, obtuse or weakly mucronate, those of the upper either wholly joined, the lip 1.5–2 mm. tall, rotund-truncate, or even retuse, or free nearly to the middle, either obtuse or weakly mucronate, about 1 mm. long; corolla blue, its tube cylindrical, 5–10 mm. long, pubescent within above the middle, but scarcely annulate, the upper lip 2–3 mm. tall, its lobes joined about to the middle, the middle lobe of the lower erose, often furcate; stamens seated in the throat, the connective somewhat shorter than the filament, the connection obvious; posterior style branch shorter.

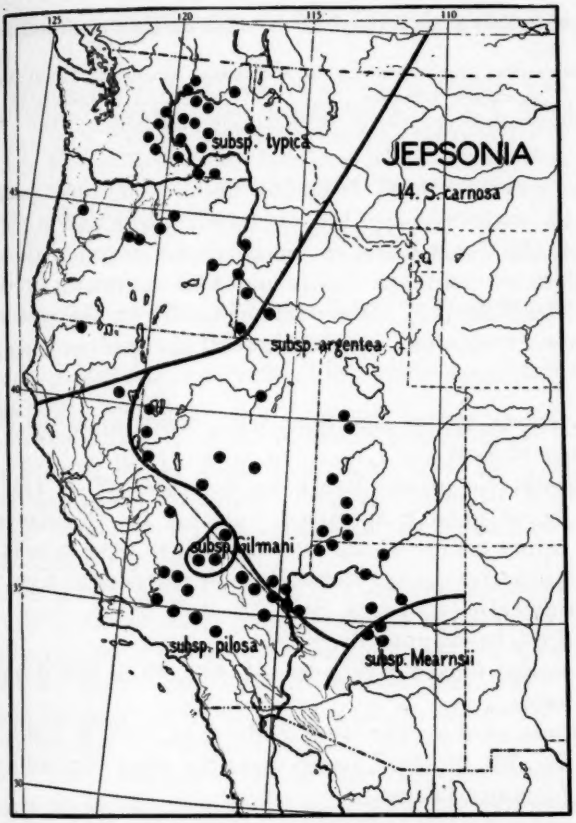

Fig. 9. Showing distribution of *S. carnosa* and its subspecies.

KEY TO THE SUBSPECIES

Leaves oblanceolate or linear, 2–4 mm. broad (see also subsp. *typica*).....
.....subsp. (b) *Mearnsii*

Leaves obovate or spatulate, rarely oblanceolate, for the most part more than 4 mm. broad.

Leaf-blades usually oval or elliptical, rarely obovate, prevailingly 1.5–3, rarely 4 cm. long.....subsp. (a) *typica*

Leaf-blades usually rotund or spatulate, abruptly narrowed to the petioles, mostly 4–15 mm., rarely 20 mm. broad.

Bracts pilose on the outer surfaces; glomerules mostly 3–4, moniliform but usually approximate.....subsp. (c) *pilosa*

Bracts usually glabrate except for the ciliate margins; glomerules mostly 2–3.
Glomerules mostly about 1.5 cm. in diameter, usually 0.5–1.5 cm. distant on slender peduncles.....subsp. (d) *Gilmani*
Glomerules mostly 1.5–2.5 cm. in diameter, generally crowded.....
.....subsp. (e) *argentea*

This species ranges from the upper Columbia southward along the eastern base of the coastal cordillera and in the mountains of the Great Basin to the northern slopes of the coastal cordillera of southern California and eastward in Arizona almost to Flagstaff. It occurs primarily in association with *Artemisia tridentata*, verging toward the juniper-pine association.

14a. subsp. **typica** Epl. nom. nov., based upon the Douglas specimen at Kew.

Audibertia incana Benth. in Bot. Reg. **17**: *t. 1469*. 1831, based upon a specimen collected by Douglas on the upper course of the Columbia River; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella incana Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the same.

Ramona incana Briq., op. cit. 440. 1894, based upon the same.

Salvia carnosa var. *typica* Munz in Bull. S. Calif. Acad. Sci. **26**: 21. 1927, based upon the same (excluding Californian citations).

Upper branchlets hispidulous between the glomerules; leaf-blades mostly oval or elliptic, sometimes obovate, sometimes oblanceolate, 1.5–3, rarely 4 cm. long, gradually narrowed to the petioles and usually twice their length or more; mature glomerules usually 2–2.5 cm. in diameter, usually 3–4 in an interrupted spike, for the most part less than 1 cm. distant, subtended by opaque usually greenish hispidulous-ciliate bracts, their veins scarcely prominent.

This subspecies is known to me only from herbarium material save for a casual acquaintance years ago near Spokane. It is apparently a component of the *Artemisia tridentata* formation ranging into the juniper belt, occurring mostly between 2000 and 3000 feet.

Following are localities from which the subspecies has been gathered:

WASHINGTON: OKANOGAN: Omak, Soap Lake, Brewster; STEVENS: Loon Lake; CHELAN: Wenatchee; DOUGLAS: Egbert Springs; LINCOLN: Almira, Odessa; SPOKANE: Spokane Falls, Spokane; KITTITAS: Ellensburg; GRANT: Wilson Cr., Soap Lake, Vantage, between Ephrata and Coulee City; YAKIMA: Donald, Snipes Mt. near Yakima, Yakima R.; BENTON: Rattlesnake Mts.; FRANKLIN: Kahlotus; WALLA WALLA: near Wallula, Walla Walla.

IDAHO: WASHINGTON: Weiser; OWYHEE: Reynolds Cr.

OREGON: WHEELER: Mitchell; GRANT: Mt. Kimberly; CROOK: Maurey's Mts. near Prineville; MALHEUR: near Adrian.

CALIFORNIA: rocky slopes along the Klamath R. near the Pacific Highway in the juniper belt.

14b. subsp. **Mearnsii** Epl. comb. nov., based upon *Audibertia Mearnsii* Britt., loc. cit.

Audibertia Mearnsii Britt. in Trans. N. Y. Acad. Sci. **8**: 71. 1889, and in the Bull. Torr. Bot. Club **16**: 202. 1889, based upon a specimen collected by Mearns in Arizona near Fort Verde; the type is in the herbarium of the N. Y. Bot. Garden.

Branchlets more or less hispidulous between the glomerules; leaf-blades oblanceolate or linear, 1–2 cm. long, 2–4 mm. broad, gradually narrowed to obscure petioles, mature glomerules usually 2–2.5 cm. in diameter, for the most part 2, about 1 cm. distant in an interrupted spike, or solitary, subtended by glabrous purple shining venulose bracts.

This subspecies is known to me only from very inadequate herbarium material. It is known to occur at three places only: 10 miles east of Jerome Junction (now Copper Station, 1 mi. east of Chino Valley P. O.), at Schuerman's near Sedona, and on the sides of small canyons in limestone near Fort Verde, all in Arizona. It may be highly localized (for I was unable to find it in this region when searching for it) and presumably occurs in association with mesquite.

14c. subsp. **argentea** Epl. comb. nov., based upon *Audibertiella argentea* Rydb., loc. cit.

Audibertiella argentea Rydb. in Bull. Torr. Bot. Club **36**: 683. 1909, based upon a specimen collected in Arizona at Mokiak Pass by Palmer (no. 395); the type is in the herbarium of the N. Y. Bot. Garden.

Branchlets usually hispidulous between the glomerules; leaf-blades usually 8–15 mm., even 20 mm. in diameter, obovate or rotund, abruptly narrowed to petioles somewhat shorter; glomerules usually 2–3, usually congested, sometimes into a compact spike, rarely 1 cm. distant, subtended by usually glabrous, venulose, shining purple or blue bracts.

This subspecies is known to me from herbarium material only. The following are localities from which it is recorded; it ranges higher than the other subspecies and probably occurs in the *Artemisia* and the piñon associations:

IDAHO: OWYHEE: Bruneau.

UTAH: TOOELE: Granite Mts., 5000 ft.; JUAB: Dugway Range, near Detroit, 21 mi. west of Sulphur Springs; BEAVER: Wa Wa; IRON: Cedar Canyon, 6800 ft.; WASHINGTON: Valley of the Virgin near St. George, Santa Clara Valley, 5000 ft., Beaverdam Mts., Zion Canyon, Springdale.

NEVADA: WASHOE: Virginia City, hills n. e. of Reno, 6000 ft., Truckee Desert, 4500 ft., Pyramid Lake; DOUGLAS: near Minden; MINERAL: Candelaria; NYE: Currant, Monitor Valley, 5500 ft.; EUREKA: Palisade; CLARK: Los Vegas Mts., Indian Spring of Charleston Mts., 4000 ft., Lee Canyon of Charleston Mts., 8700 ft.

ARIZONA: MOHAVE: House Rock, Mokiak Pass, Union Pass, Pagumpa at head of Grand Wash; COCONINO: Bright Angel and Hermit Trails of Grand Canyon, Willow Spring, near Flagstaff; 50 miles south of Lee's Ferry.

CALIFORNIA: MONO: Topaz; INYO: Nelson Range near Lee's Pump; (?) RIVERSIDE: near Daggett.

14d. subsp. **Gilmani** Epl. subsp. nov., based upon a collection made by Epling and Gilman in the Panamint Mts. (Piñon Mesa, Wild Rose Canyon); the type is in the herbarium of the University of California (Los Angeles).

Branchlets hispidulous or sometimes pilose between the glomerules; leaf-blades prevailingly 4–7 mm. in diameter, rotund or spatulate, abruptly narrowed to petioles 2.5 mm. long; mature glomerules usually about 1.5 cm. in diameter, sometimes solitary, mostly 2–3 in interrupted spikes, .5–1.5 cm. distant, borne on slender peduncles, subtended by rather opaque, rarely shining bracts which are glabrous or hispidulous, rarely pilose, and usually rose-colored.

It is a pleasure to associate with this plant of the Death Valley Region the name of Mr. French Gilman, curator of the botanic garden in Death Valley and long-time student of the flora and fauna of the Sonoran desert. I am indebted to Mr. Gilman

for notes regarding the distribution of Death Valley and Panamint Labiatae.

This subspecies occurs just at the lower margin of the juniper-piñon association ranging chiefly in the *Artemisia* association from about 3000–7000 feet. It intermixes occasionally with *S. pachyphylla* (Wild Rose Canyon) but, perhaps due to the differences in flowering time, apparently does not hybridize with it.

It is known from the following localities:

CALIFORNIA: INYO: Panamint Mts. (Ubehebe, Panamint Canyon, Wild Rose Canyon, Hanaupah Canyon, Suprise Canyon), Argus Mts. (Shepherds Canyon). NEVADA: CLARK: Valley of Fire; ESMERALDA: Goldfield.

The specimens cited from Nevada may rather be subsp. *argentea* but seem to be this clearly, especially the Goldfield specimen. Specimens from the Providence and New York Mountains, as well as near Chloride, are more or less intermediate.

14e. subsp. **pilosa** Epl. comb. nov., based upon *Audibertia incana* var. *pilosa* Gray, loc. cit. Plate 25.

Audibertia Dorrii Kellogg in Proc. Calif. Acad. **2**: 190. *fig. 57.* 1863, based upon a specimen collected by C. H. Dorr, presumably near Virginia City, Nevada; the type, formerly in the California Academy of Sciences, is lost.

Audibertia incana var. *pilosa* Gray, Syn. Fl. N. Am. ed. 2, **2**: pt. 1: 461. 1886, based upon a specimen collected by the Parish brothers in the San Bernardino Mts. of California; the type is in the Gray Herbarium.

Salvia pilosa Merriam in N. Am. Fauna **7**, pt. 2: 322. 1893, based upon the same.

Audibertiella Dorrii Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia Dorrii* Kellogg, loc. cit.

Ramona Dorrii Briq. in Engler u. Prantl, Nat. Pflanzenf. IV. IIIA. 287. 1897, based upon the same.

Ramona pilosa Abrams in Bull. N. Y. Bot. Gard. **6**: 443. 1910, based upon *Audibertia incana* var. *pilosa* Gray, loc. cit.

Salvia carnosa var. *pilosa* Jeps., Man. Calif. 870. 1925, based upon the same.

Branchlets hispidulous and frequently pilose between the glomerules; leaf-blades usually rotund, frequently spatulate, usually 7–10 (rarely 15) mm. in diameter, narrowed abruptly to petioles mostly 5–7 mm. long; mature glomerules 1.5–2.5 cm. in diameter, prevailingly 4–5 in interrupted spikes, usually less than 1 cm. distant and often crowded, subtended by purplish or greenish bracts which are strongly ciliate and pilose on the backs with hairs of the same order; at the same time they are hardly opaque but somewhat shining and venulose.

The range in flower size is about the same in all the subspecies except perhaps subsp. *pilosa*. The smallest flowers are found here, particularly in a form with very compact glomerules, such as that collected by Jones near Bishop and by Munz near Deep Creek (no. 11913).

This subspecies occurs in association with *Artemisia tridentata* at the lower margin of the juniper-piñon association often with *Yucca brevifolia*, from about 3500–6000 feet.

Following are localities where it is known to occur:

CALIFORNIA: LASSEN: Hot Springs Peak; MONO: Rock Creek Canyon, 6000 ft.; INYO: near Bishop; KERN: Johannesburg, Antelope Valley, Walker Pass, Onyx, Mt. Pinos; LOS ANGELES: Palmdale, Little Rock Cr. of San Gabriel Mts., Hungry Valley, Vincent, Acton, Lancaster; SAN BERNARDINO: Victorville, Hesperia, San Bernardino Mts. (Cushenbury Grade, Deep Cr.), Providence Mts., 4000 ft., Kelso, Cajon, Ventrigger Spring, 11 mi. s. of Barstow, Hackberry Mt., New York Mts. near Ivanpah, Cima, Kingston Mts.; RIVERSIDE: Little San Bernardino Mts. (Covington Flats, Key's Ranch).

NEVADA: ESMERALDA: Amargosa Desert; CLARK: Goodsprings, Las Vegas, Eldorado Canyon at Nelson, 3000 feet.

15. S. eremostachya Jeps., Man. Calif. 870. 1925, based upon a specimen collected by him in Coyote Canyon, Indian Valley, Riverside Co., Calif.; the type is in Jepson's herbarium.

Plate 26.

An intricately branched shrub about a meter tall or less, its branchlets ashy with spreading glandular hairs, frequently pilose; leaf-blades deltoid-oblong, even linear, mostly 1.5–3.5 cm. long, 4–10 mm. wide, obtuse at the apex, truncate at the base or narrowed to more or less marginate petioles 3–8 mm. long, their margins crenulate, nearly straight, frequently revo-

lute, the upper surface bullate, the lower areolate with raised veins, both hispidulous; flowers few in sufficiently dense glomerules, disposed in interrupted spikes formed of 2–3 glomerules 1–2 cm. distant, subtended by thin rotund-ovate bracts,

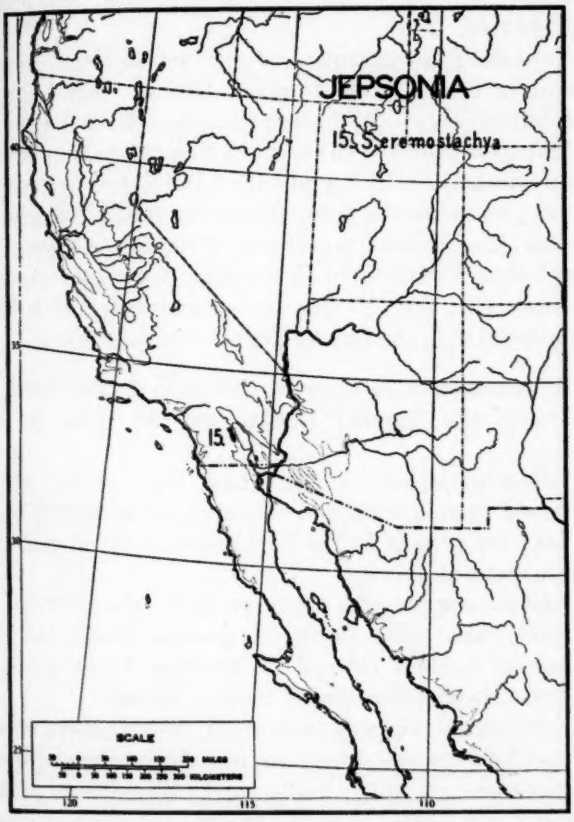

Fig. 10. Showing distribution of *S. eremostachya*.

short-acuminate, glandular, sparingly pilose; flowering calyces glandular-pilose, about 11 mm. long, the lobes of the lower lip free, 3–3.5 mm. long, weakly spinose, those of the upper wholly united unless 2- or 3-spinose at the apex, 4.5–5 mm. tall; corolla

blue or rose color, its tube cylindrical, arcuate, somewhat narrowed near the throat, pubescent within above the middle, 14–17 mm. long, the lobes of the upper lip 4–6 mm. tall, frequently erose, joined in the middle, the middle lobe of the lower lip forked and strongly eroded, rotund; stamens seated in the throat, the connective and filament subequal; posterior style branch shorter.

This species is a component of the *Larrea-Franseria* formation, ranging from 1200 ft. to about 4500 ft. It is known from three localities only: (a) Indian Canyon, Collins Valley, Santa Rosa Mts. near Borego, (b) eastern San Diego Co., Rockhouse Canyon, Santa Rosa Mts., and (c) on the Palms to Pines Highway from just below the piñon belt to the foot of the grade. Its associates are *Larrea mexicana, Prunus eriogyna, Salvia apiana, Salvia Vaseyi, Acacia Greggii, Encelia farinosa, Krameria canescens,* and *Eriogonum fasciculatum.* Hybrids have been observed with the two *Salvia* species mentioned.

16. S. sonomensis Greene in Pittonia **2**: 236. 1892, based upon *Audibertia humilis* Benth., loc. cit. (not *S. humilis* Benth.). Plate 27.

Audibertia humilis Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella humilis Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia humilis* Benth., loc. cit.

Ramona humilis Greene in Erythea **1**: 44. 1893, based upon *Audibertia humilis* Benth., loc. cit.

A low perennial creeping herb often forming mats, its flowering stems 15–30 cm. tall, hispid in the inflorescence with spreading more or less glandular hairs, rarely hispidulous with short glandular hairs, softly retrorse-hirsute below; leaf-blades elliptical-obovate, generally 3–6 cm. long, rounded at the apex, attenuate at the base to subequal petioles, their margins crenulate, the upper surfaces bullulate, cinereous, hirtellous, the lower appressed-tomentose, more or less whitened; flowers

numerous in glomerules 1–5 cm. distant, forming interrupted moniliform spikes 10–25 cm. over all, borne on subequal peduncles, subtended by acute appressed elliptical villous bracts; flowering calyces 6–9 mm. long, the lobes of the lower lip free,

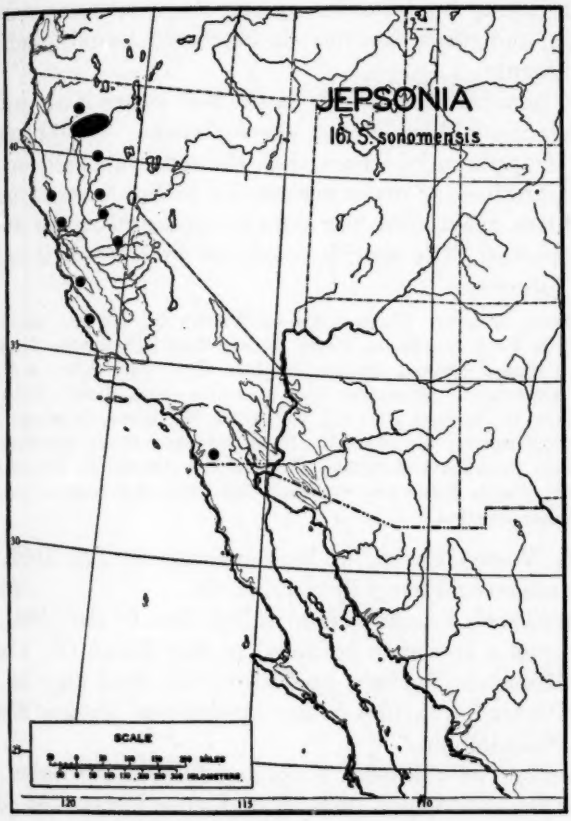

Fig. 11. Showing distribution of *S. sonomensis.*

those of the upper wholly united, trimucronate at the apex; corolla pale violet, its tube 4–8 mm. long, villous-annulate near the middle, the lobes of the upper lip nearly free, 2–3 mm. long, mostly acute, the lower lip thrice as long, its middle lobe rotund,

erose; stamens seated on the base of the lower lip, the filament and connective subequal, their point of connection obscure, entire, the upper staminodia often prominent; style branches very short, the upper somewhat shorter than the lower.

This species occurs generally along the Sierra foothills from Shasta County to Calaveras; along the coast ranges in Lake, Sonoma, and Napa counties; in Monterey County and in San Diego County.

I am familiar with it only in the last where it occurs under thin chamise: *Adenostoma fasciculatum.* In its northern range it apparently occurs with the oak woodland or yellow pine formations or under manzanita within these formations. No hybrids are known, nor does it apparently grow with any other species. The specific localities from which it is known are as follows:

CALIFORNIA: SHASTA: Ydalpom, Kennet, O'Brien Cr., Cow Cr.; SISKIYOU: McCloud, Pit R. Ferry, Mt. Shasta, Sisson, Burney, Bully Hill; BUTTE: Forest Ranch, 2700 ft., Cohasset; NEVADA: Banner Hill, Lake City, Grass Valley; SACRAMENTO: Folsom; CALAVERAS: Mokelumne Hill, Murphy's Camp, Devil's Gulch; LAKE: Lower Lake, Mt. Konocti, 3000 ft.; NAPA: Mt. St. Helena, Calistoga; SONOMA: Sonoma; SAN BENITO: San Juan, Mt. Hood, Fremont's Peak; MONTEREY: Santa Lucia Peak, Tassajara Hot Springs, N. Fork San Antonio R., Arroyo Seco R.; SAN DIEGO: Harper Ranch near Cuyamaca Lake, top of Cuyamaca Peak, Guatay Mt., Descanso Junction.

17. S. Vaseyi Parish in Muhlenbergia **3**: 126. 1907, based upon *Audibertia Vaseyi* Porter, loc. cit. Plate 28.

Audibertia Vaseyi Porter in Bot. Gaz. **6**: 207. 1881, based upon a specimen collected in San Diego Co., Calif., at Mountain Springs by Vasey; the type may be in the Porter herbarium at the Academy of Natural Sciences, Philadelphia.

Audibertiella Vaseyi Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia Vaseyi* Porter, loc. cit.

Ramona Vaseyi Briq., loc. cit., 440. 1894, based upon the same.

A low rounded snowy shrub as much as a meter tall, its branchlets minutely incano-puberulent; leaf-blades prevailingly deltoid-ovate, 3–5 cm. long, obtuse at the apex, truncate at the base or abruptly cuneate, their margins crenulate, both

surfaces densely whitened with minute appressed hairs, borne on petioles 5–10 mm. long; flowers many in compact glomerules disposed in moniliform long-peduncled spikes 30–60 cm. long, 3–8 cm. distant, subtended by whitened bracts, the outer ovate,

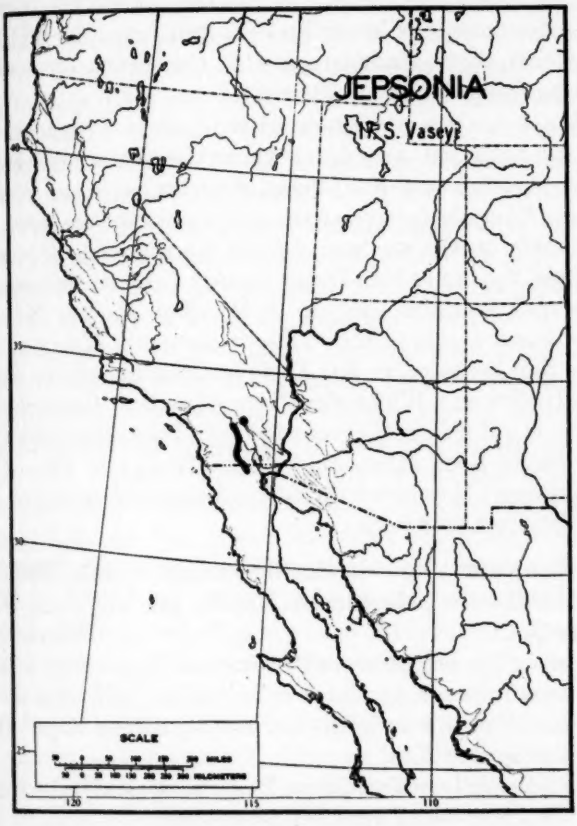

Fig. 12. Showing distribution of *S. Vaseyi*.

the inner lanceolate, all tipped with a stout bristle; flowering calyces whitened with minute hairs, 8–10 mm. long excluding the bristles, the lobes of the lower lip deltoid-ovate, free, drawn into a bristle 3–4 mm. long, as much as 8 mm. long over all,

those of the upper wholly united, the lip drawn into a bristle as long as the body, 5–8 mm. long over all; corolla white, its tube 11–14 mm. long, strongly pilose-annulate within near the middle and vertically compressed, the throat closed, the lobes of the upper lip almost completely joined, the lip rotund, retuse, 3–4 mm. in diameter, the lower lip 7–12 mm. long, the middle lobe obreniform, erose; stamens seated in the throat, the connective somewhat longer than the filament.

This species is a component of the *Larrea-Franseria* formation, its principal associates being *Larrea mexicana, Eriogonum fasciculatum polifolium, Encelia farinosa, Franseria dumosa, Fouquieria splendens,* and *Yucca mohavensis.* It occurs chiefly on the western side of the Colorado Desert from Mountain Spring in San Diego County (and doubtless in Baja California) to Palm Canyon in the San Jacinto Mountains. On the eastern side of the valley it occurs in Morongo Valley (Little San Bernardino Mts.). It is abundant on the Palms to Pines Highway. While doubtless abundant throughout this range it is not otherwise recorded save from Martinez Canyon in the Santa Rosa Mountains, Yaqui Well, and Palm Canyon near Borego. It occurs with *Salvia eremstachya* and *S. apiana* and hybridizes with both.

18. S. apiana Jeps. in Muhlenbergia **3**: 144. 1908, based upon *Audibertia polystachya* Benth., loc. cit. (not *S. polystachya* Ort.). Plates 29 & 30.

Audibertia polystachya Benth., Lab. Gen. et Sp. 314. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella polystachya Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the preceding.

Ramona polystachya Greene in Pittonia **2**: 235. 1895, based upon the same.

S. californica Jeps., Fl. W. Middle Calif. 460. 1901, based upon the same (not *S. californica* Brandegee).

S. apiana var. *typica* Munz in Bull. S. Calif. Acad. Sci. **26**: 25. 1927, based upon *S. apiana* Jeps., loc. cit.

S. apiana var. *compacta* Munz, loc. cit., based upon a specimen collected in Riverside Co., Calif., in the Dry Morongo Wash, by Munz and Johnston (no. 5170); the type is in the herbarium of Pomona College.

A snowy shrub 1–2 or even 3 m. tall, its branchlets whitened with minute appressed hairs; leaf-blades either elliptical or oval, mostly 5–10 cm. long, obtuse at the apex, narrowed at the base to petioles 0.5–2 cm. long, their margins crenulate, frequently subentire, both surfaces whitened with very minute appressed hairs; flowers few in lax glomerules, subtended by ovate-lanceolate frequently subspinose bracts mostly shorter than the calyces, spreading or deflexed, disposed in striking elongated panicles as much as 1.5 m. long, the branchlets either ascending or shortened and appressed to the axis, thus forming a spike-like thyrsis or even an apparent interrupted spike; flowering calyces 5–7.5 mm. long, whitened with very minute appressed hairs, the lower teeth mostly free, ovate, about 1.5 mm. long, obtuse or subspinose, the upper wholly united, the lip obtuse, truncate or retuse, hardly mucronate; corolla whitish, commonly speckled with lavender, its tube 5–7 mm. long, pilose in the throat, commonly annulate, the upper lip entire or retuse, 1.5–2 mm. tall, plane, recurved, the lower 8–20 mm. long, abruptly bent at the base and ascending, thus closing the orifice, the middle lobe rotund, erose, cupped, deflexed, 4.5–12 mm. broad; stamens seated on the base of the lower lip, ascending and divaricate, the connective longer than the filament; style deflexed.

This species is an important and characteristic component of the coastal sage formation, ranging into the western margins of the *Larrea-Franseria* formation from Santa Barbara County to about 30 miles north of Punta Prieta in Lower California. It occurs also in isolated colonies within the chaparral (chamisal), the piñon-juniper, and even reaches to the yellow pine forest. It has the greatest altitudinal range of any species save perhaps *S. Columbariae*. It occurs very commonly with *Eriogonum fasciculatum*. It may occur with *S. mellifera, leucophylla, Clevelandii, eremostachya, pachyphylla, Vaseyi,*

Munzii, Columbariae, and *carduacea.* It forms hybrids with all but the last two. I have seen it also in the vicinity of but not actually with *S. spathacea, sonomensis, carnosa,* and *mohavensis.* In Lower California it reaches into the *Idria* association.

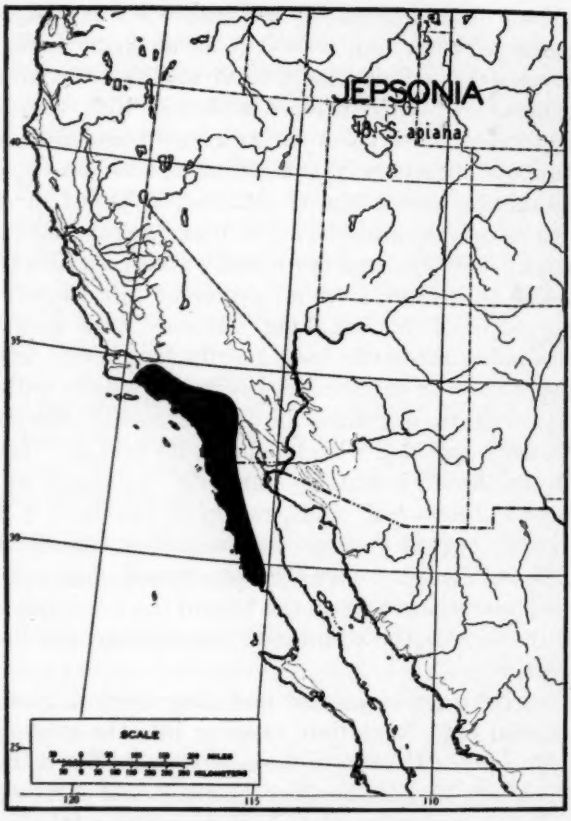

Fig. 13. Showing distribution of *S. apiana.*

It is obviously the most catholic of all the Audibertias. As it occurs along the western margin of the Colorado Desert, it becomes more compact in inflorescence (var. *compacta* Munz) but not otherwise modified. This more compact form is by no

means consistent in its occurrence, however, and is not well defined. Since its range is largely marginal to that of *Salvia Vaseyi*, I have wondered whether these more compact forms might represent slight intermixture with that species, with which clearly defined hybrids do occur.

As the flowers open they tend to have the conformation of the flowers of *S. Vaseyi* or *S. eremostachya*. The elongate lower lip is soon reflexed, however, in most cases. It may not be so reflexed in occasional plants. While usually with a whitish speckled corolla (yellowish in the bud), occasional forms occur with a fairly well-defined bluish tinge.

Following are localities where the species may be found:

CALIFORNIA: SANTA BARBARA: Santa Barbara Mts. (Billiard Flat), Santa Barbara; VENTURA: Topa Topa Mts., Piru Cr.; LOS ANGELES: San Gabriel Mts. (Big Rock Cr.), Claremont, Los Angeles (Elysian Park), Westwood, Santa Monica Mts., Verdugo Hills, Sierra Madre, Monrovia, Acton, Antelope Valley, Newhall, Mt. Lowe; SAN BERNARDINO: San Bernardino, Cajon Pass; RIVERSIDE: Whitewater, Morongo Wash, Corona, Box Springs, Menifee, Sage, San Jacinto, Ramona, San Jacinto Mts. (Snow Cr.), Massacre Canyon; ORANGE: Rincon, Santa Ana Canyon; SAN DIEGO: Otay Mesa, Coronado Isl., Santa Rosa Mts., Flinn Springs, Lake Hodges, Mountain Springs, Jacumba, San Felipe, Vallecitos, Mason Valley, La Jolla, Oak Grove, Palomar Mt., Witch Cr.; SANTA CATALINA ISLAND.

BAJA CALIFORNIA: San Pedro Martir, San Antonio Canyon, Sacaton, Tijuana, 34 mi. n. of Punta Prieta (furthest south observed), Jaraguay, Cataviña, El Marmol, Arroyo Seco between Johnson Ranch and San Antonio Mesa.

HYBRIDS

When two or more species of *Salvia* are found growing with or near each other occasional or sometimes numerous plants may be found which are more or less intermediate between these species. While it is true that, to my knowledge, no hybrids have as yet been produced by hand, it seems hardly other than that these intermediate plants are natural hybrids, particularly since they are seldom, if ever, found apart from the supposed parent species. I consider them to be such. In habit, in foliage, in pubescence, and in floral characteristics they are generally intermediate, although in some cases may resemble one parent or the other very closely, only small clues indicating the compound heritage. They are not markedly more robust than the parents although sometimes with somewhat larger

flowers. In fact, the foliage is reduced in size if anything. Whether they are fertile is unknown but by inference from their infrequence and association with the parent species, which are otherwise quite constant, it would appear that they are not. Apart from their intermediate nature I have observed several facts of interest, namely, that the branched pubescence of *S. leucophylla* is dominant, always (in my experience) appearing in the hybrid, although modified and not so luxuriant, and that the lower end of the connective, which in the parents is completely lost, is slightly but definitely developed in occasional hybrids. With one exception, namely *S. apiana* × *pachyphylla,* the anthers appear normal. There is some slight suggestion that hybridization produces an elongation to the upper calyx lip as in *S. Columbariae* and *S. Vaseyi.*

A drawing has been included (fig. 14) which will indicate to a certain degree the intermediate nature of the average hybrid. It shows flowers from *S. Columbariae* and *S. mellifera* and the intermediate (known as *S. bernardina).* It will be seen that the calyx is about intermediate; the corolla of the hybrid is more nearly that of *S. Columbariae,* the stamens more nearly those of *S. mellifera.* The resemblance of this hybrid flower to the flower of *S. Munzii* is remarkable and, to me, suggestive of the probable course of speciation within the section. I have seen similar hybrids, almost certainly between *S. eremostachya* and *S. apiana,* which strongly suggested *S. Vaseyi* in habit and structure.

While in so far as observation has permitted, it would appear that the hybrids usually occur anywhere in the range of the parent species, *S. bernardina (S. Columbariae* × *mellifera)* appears to be restricted to the vicinity of San Bernardino, although the parents occur together over wide areas.

The following have been observed:

A. *S. apiana* × *Clevelandii (S. Palmeri)*
B. *S. apiana* × *mellifera*
C. *S. apiana* × *leucophylla*
D. *S. apiana* × *pachyphylla*
E. *S. apiana* × *Munzii*

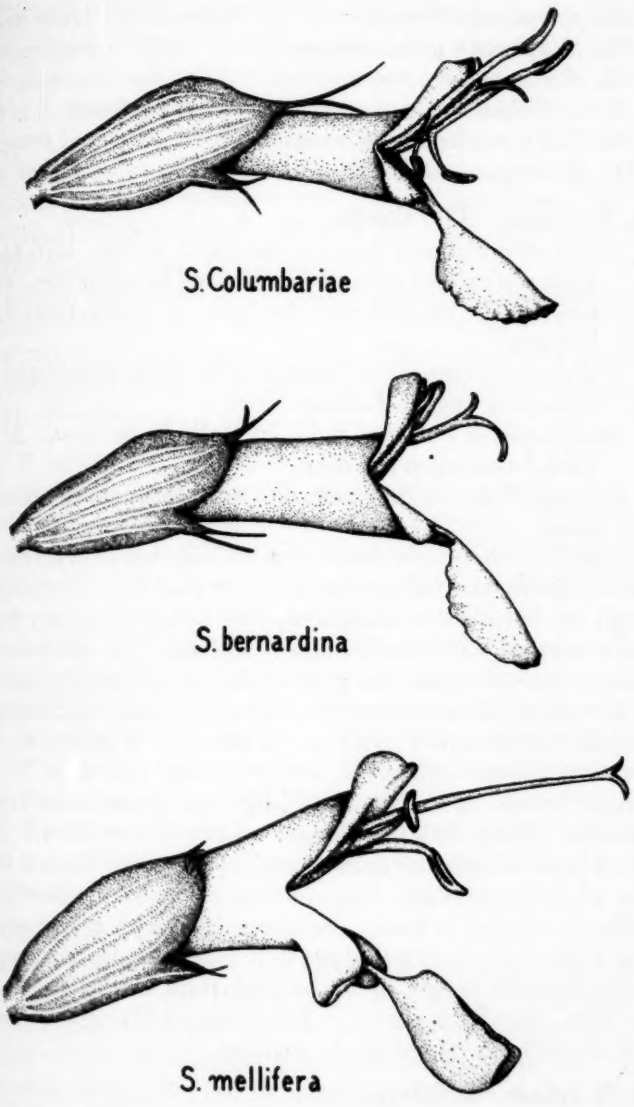

Fig. 14. Flower of *S. bernardina* compared with those of its parents.

F. *S. apiana* × *Vaseyi*
G. *S. apiana* × *eremostachya*
H. *S. leucophylla* × *mellifera*
J. *S. Columbariae* × *mellifera (S. bernardina)*
K. *S. Clevelandii* × *leucophylla*
L. *S. eremostachya* × *Vaseyi*

A. **S. apiana × Clevelandii**

Audibertia Palmeri Gray in Bot. Calif. **1**: 601. 1876, based upon a specimen collected on Tighes Ranch in San Diego Co., Calif., by Palmer; the type is in the Gray Herbarium.

S. Palmeri Greene in Pittonia **2**: 236. 1892, based upon the preceding (not *S. Palmeri* Gray).

Audibertiella Palmeri Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon the same.

Ramona Palmeri Briq., loc. cit., 440. 1894, based upon the same.

In habit this hybrid is about intermediate between its parent species, having the foliage more nearly that of *S. Clevelandii*, though perhaps more elongated, the flowering stems being more elongated, after the habit of *S. apiana*. The inflorescence is about intermediate, the glomerules being usually smaller and instead of being solitary are numerous, and it is branched. The pubescence of the plant would not at first glance appear different, though whiter in some forms, especially in the younger leaves, these becoming glabrate in age, contrary to *S. apiana*. The petioles are longer than in *S. Clevelandii*. The calyces both in form and pubescence are scarcely different from those of *S. Clevelandii*. The corollas are about midway, suggesting *S. Vaseyi* in habit, the upper lip being nearly entire, about 5 mm. tall, the lower about 9–10 mm. long, lightly cupped, the middle lobe larger in proportion than in *S. Clevelandii*. The pilose annulus is seated at about the middle of the tube, in other words in an intermediate position.

B. **S. apiana × mellifera**

In habit this is a more robust plant than *S. mellifera* with more elongate branches, thus resembling *S. apiana*. The foli-

age is about intermediate in size and texture, being usually more pubescent than *S. mellifera* but not so white as *S. apiana*. The closeness and density of the pubescence is more nearly that of *S. apiana*. The inflorescence is about intermediate, being more branched than is usual with *S. mellifera*, the branchlets tending to be erect as in the thyrsis of *S. apiana*, rather than to spread in an arcuate manner as in *S. mellifera*. The pubescence of the bracts and calyces is finer and more appressed than in *S. mellifera*, thus resembling *S. apiana*. The flowers are intermediate, both in size and form. The stamens project straight from the tube instead of ascending under the upper lip as in *S. mellifera* and are longer. The corolla-tube is piloseannulate below or near the middle, more broadly and coarsely than in *S. mellifera*.

C. **S. apiana × leucophylla**

A stout plant resembling *S. apiana* more in habit, with the stout elongated flowering stalks of that species. The pubescence throughout is that of *S. leucophylla* but the foliage is not so whitened. The leaves are intermediate in texture and more or less truncate at the base, but their margins are more convex than in *S. leucophylla*. The inflorescence is panicled but distinctly glomerulate, the glomerules being more compact and larger than in *S. apiana*. The calyces have the form of those of *S. leucophylla* but bear two small teeth partly adnate to the upper lip which is usually entire. The corollas are about intermediate, having a pilose annulus above the middle of the tube as in *S. leucophylla* and a plane middle lobe which is broader than in *S. leucophylla*. The stamens are declined as in that species.

D. **S. apiana × pachyphylla**

Known to me only from a single herbarium specimen: ***Munz 5829***, collected in the Santa Rosa Mountains. The peculiar nature of the calyx, almost wholly that of *S. pachyphylla*, the oblong and thin bracts, the intermediate nature of the foliage in texture and form, the intermediate nature of the inflorescence and of the corolla, all suggest most strongly such a hybrid. The corollas vary considerably in size and length of tube,

are pilose below the middle of the tube, the upper lip is entire or notched, the lower lip is variable in size. The peculiar geniculate character of the stamens is unusual as well as the apparently incomplete development of the anthers which in most hybrids are apparently normal. Some seeds, however, were beginning their development.

E. S. apiana × Munzii

In the region of Sacaton and San Antonio Mesa in northern Lower California *S. apiana* and *S. Munzii* frequently occur together. Two plants of hybrid origin were found, one at the entrance to Cedar Cañon near San Antonio Mesa and one on the second ridge north of San Vicente on the Sacaton road. They are about intermediate and resemble the hybrids of *S. apiana* and *mellifera*.

F. S. apiana × Vaseyi

An undoubted hybrid between these parents was found growing with abundant *S. Vaseyi* at Palm View on the Palms to Pines Highway and about a mile from abundant *S. apiana compacta*. As might be expected from the general similarity of the parents, it was not readily detected. In habit and in flowers it was about intermediate, the flowers being distinctly glomerulate. One is led to wonder whether *Salvia apiana* var. *compacta* represents, in part at least, an intermixture with *S. Vaseyi*, since the two occur in approximately contiguous range along the western margin of the Colorado Desert. The corollas of *S. apiana* var. *compacta* are often larger than those of the typical species.

G. S. apiana × eremostachya

These parents were found growing together freely at a point .6 mi. below the Shumway Road, Palms to Pines Highway (from Idylwild to Palm Springs). This point marked the upper limit of *S. eremostachya* and the lower limit of *S. apiana*. About a mile further down the highway occurs the upper limit of *Salvia Vaseyi*. *S. apiana* was mostly of the more compact form although some specimens were scarcely more so than coastal forms. There was some slight suggestion in foliage

habit that the more compact forms might represent intermixtures with *S. Vaseyi.* With the first-named parents several hybrid plants were found. While more or less intermediate in general habit, one was scarcely different from *S. eremostachya* in many ways. In general they suggested a plant with the foliage of *S. leucophylla* and the inflorescence of *S. Vaseyi.* The pubescence of the leaves was like that of *S. apiana* in type but coarser; that of the flowers intermediate and less glandular than of *S. eremostachya.* The corollas were mostly larger than with either parent. Growing with these parents and hybrids was a single plant hard to identify. Generally of the aspect of *S. Vaseyi,* its leaves were corrugated and much greener. The flowers were essentially those of *S. Vaseyi,* but still not typical. It may represent *S. Vaseyi* with a slight intermixture of *S. eremostachya,* but was not at all like the presumed hybrid of this parentage found several miles lower on the highway.

H. **S. leucophylla × mellifera**

In habit much like *S. mellifera* but with usually larger leaves more oblong and cuneate at the base but hardly truncate, the texture more nearly that of *S. mellifera,* the pubescence branched but lacking the density of that of *S. leucophylla.* Inflorescence stouter than in *S. mellifera,* but frequently branched after the habit of that species, the glomerules larger, more compact, the pubescence of the bracts and calyces branched. Calyces resembling those of *S. leucophylla,* but the two lower teeth present. Corolla-tube mostly 10–11 mm. long, strongly pilose-annulate just above the middle, the upper lip intermediate, the lower cupped more after the habit of *S. mellifera.* Stamens thrust forward, exserted 5–8 mm.

J. **S. Columbariae × mellifera**

S. bernardina Parish in Bull. Calif. Acad. **1**: 211. 1885, based upon a specimen collected by Parish near San Bernardino, Calif.

S. Columbariae var. *bernardina* Jeps., Man. Calif. 869. 1925, based upon the same.

A low shrub with rather fleshy branchlets clothed above with spreading hairs, its leaves about intermediate between those

of the parent species, having the approximate outline and texture of *S. mellifera* but pinnately lobed, the pubescence being rougher, less appressed than in *S. mellifera,* and more abundant than in *S. Columbariae.* Glomerules about intermediate, 2–3 in a spike, these occasionally ternate, the bracts more rotund than those of *S. mellifera* but less so than those of *S. Columbariae,* these and the calyces more villous than either of the parents, the latter without the tuft of hairs on the back as in *S. Columbariae* and more similar to those of that species. Corolla intermediate in form, the stamens being those of *S. Columbariae* but less exserted and the secondary anthers somewhat more dwarfed. The corolla-tube is annulate near the middle as in *S. mellifera* but less sharply so. This hybrid is known to me from herbarium specimens only. While the parent species occur together frequently, the hybrid is rare.

K. **S. Clevelandii × leucophylla**

A single specimen has been seen at the Rancho Santa Ana Botanic Garden where the two parent species are growing together (the former planted). It is a rounded shrub about intermediate in habit and in foliage, the inflorescence being interrupted-spicate with more remote glomerules than in *S. leucophylla.* The glomerules themselves and the flowers are nearly those of *S. Clevelandii,* the corolla being paler blue, smaller (its tube 11–12 mm. and annulate below the middle), and of a somewhat different conformation. The branched trichomes of *S. leucophylla* appear unchanged on the foliage; those of the calyces are intermediate. The odor is more like that of *S. leucophylla.*

L. **S. eremostachya × Vaseyi**

A single plant was found on the Palms to Pines Highway 1.5 mi. above the viaduct at the foot of the grade. It was growing with abundant *S. Vaseyi.* The habit was much like that of *S. eremostachya,* the inflorescence being glomerulate but not elongate. The foliage was intermediate; the flowers were not unlike those of *S. eremostachya* but with less glandular pubescence.

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New names are printed in **bold-face** type; previously published names in ordinary type; and synonyms in *italics*.

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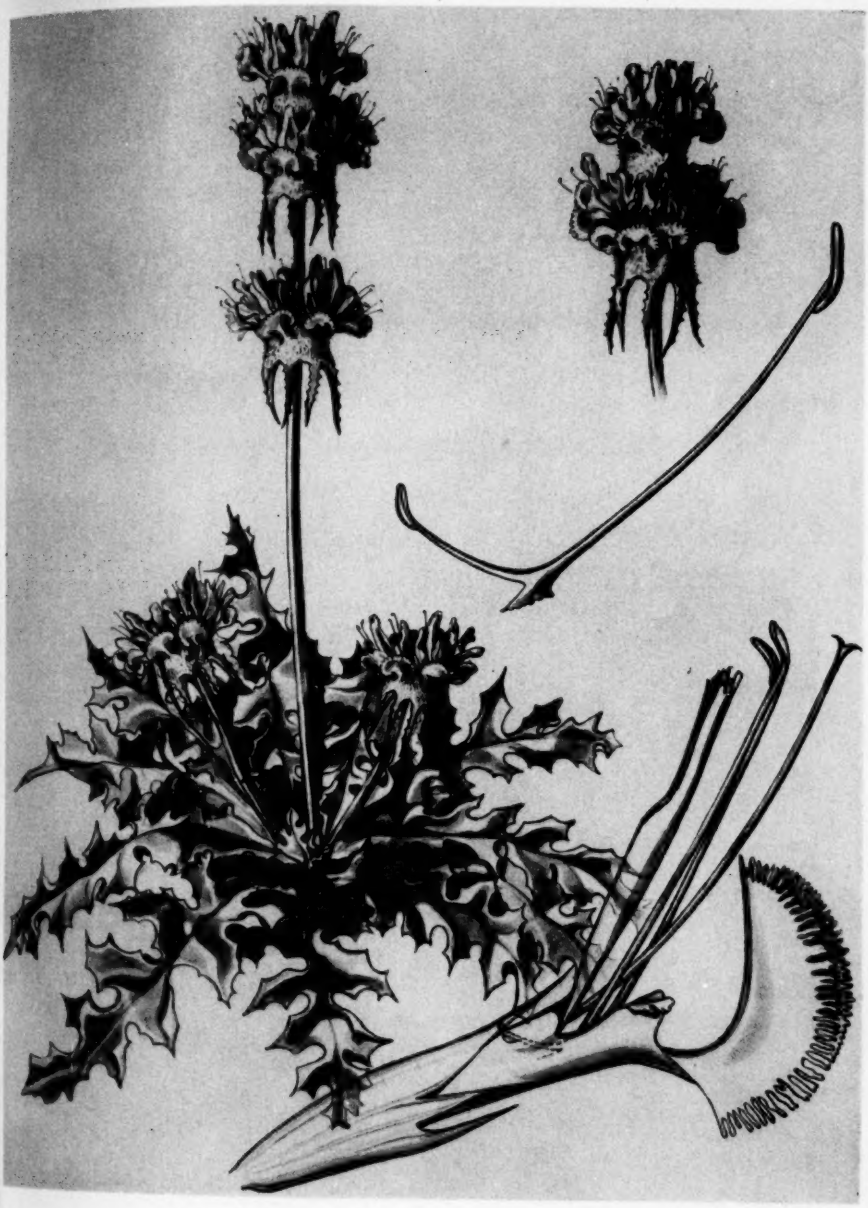
PLATE 12

Salvia carduacea.

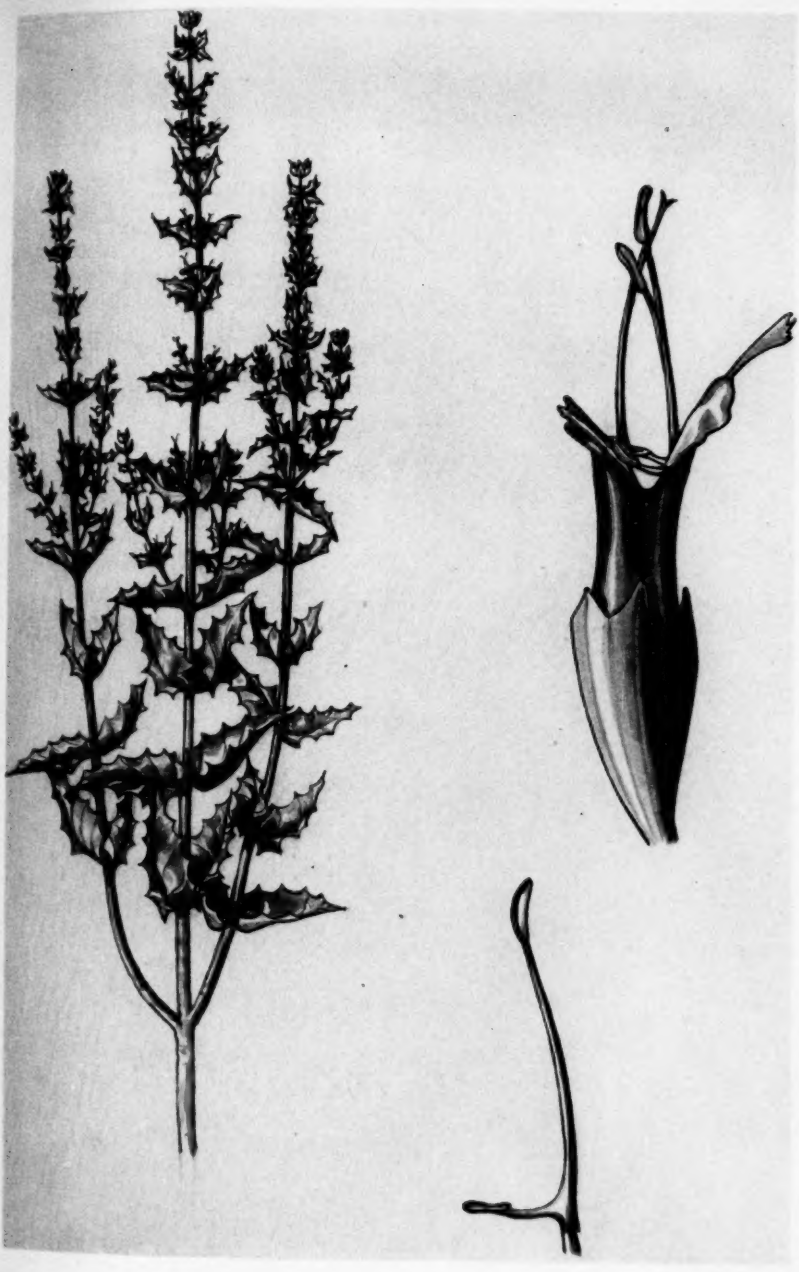


EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 13

Salvia californica.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 14

Salvia funerea.

In the upper right-hand corner is a branchlet in fruit. The dense, branched hairs form a globular, more or less adhesive mass such that the calyces cling to each other and to other objects and are blown by the wind.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 15

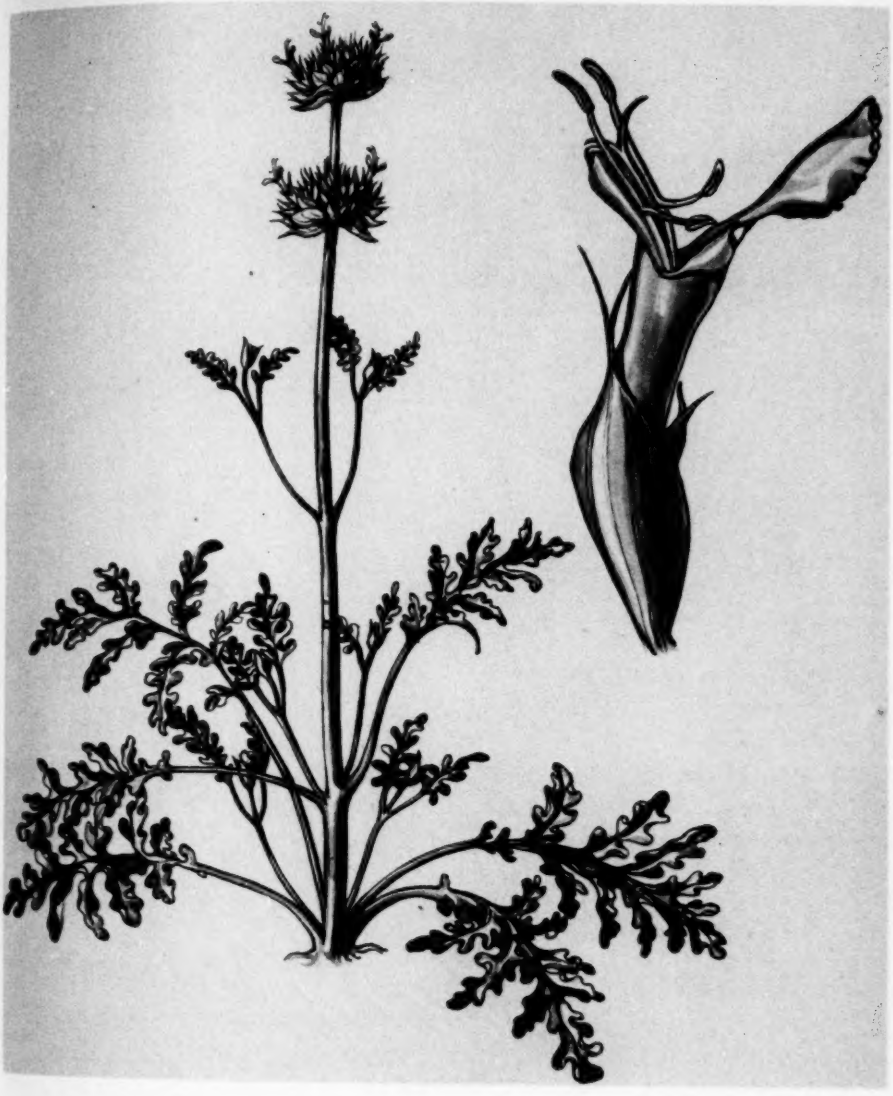
Salvia Greatae.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 16

Salvia Columbariae.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 17

Salvia spathacea.

The imperfect anther rarely, if ever, bears pollen.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 18

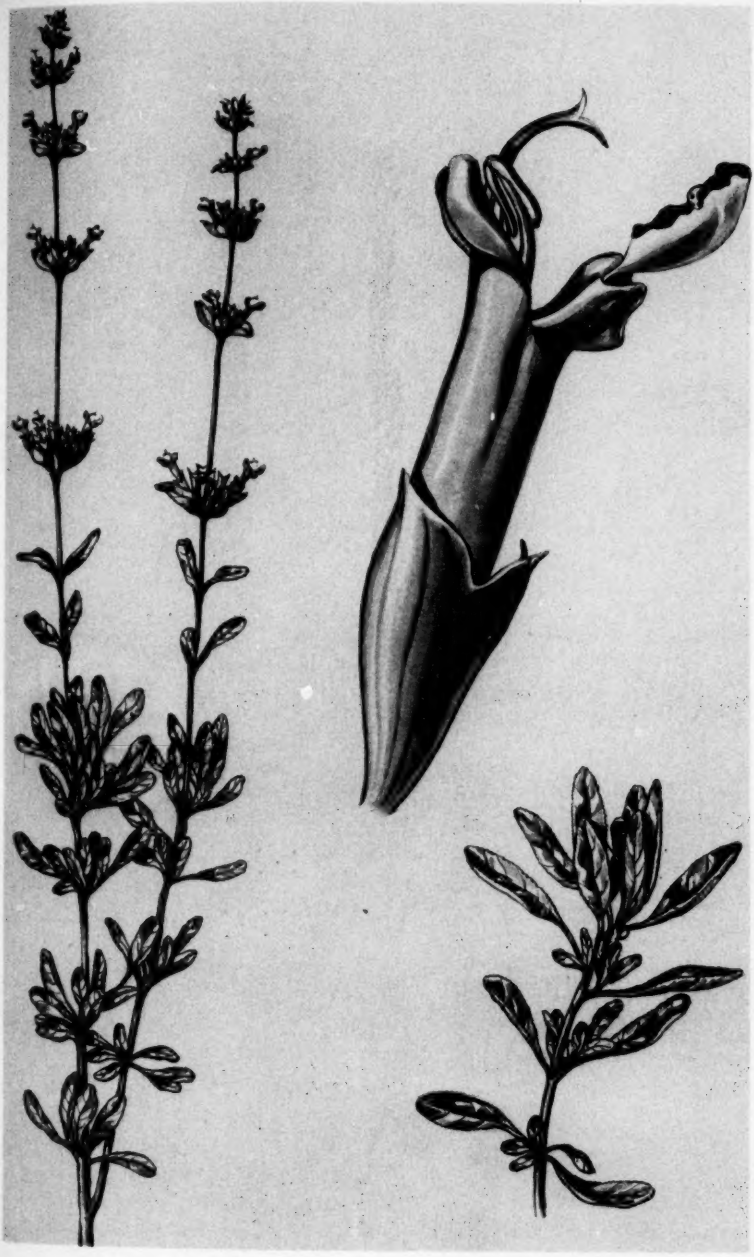
Salvia mellifera.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 19

Salvia Munzii.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 20

Salvia Brandegei.

The flower in this case was reproduced from a boiled specimen. The author has not seen the living plant in flower, but, judging from the few herbarium specimens which have been collected, the stamens are as indicated.

EPLING — THE CALIFORNIAN SALVIAS

Explanation of Plate

PLATE 21

Salvia Clevelandii.

The lower lip of the corolla is essentially plane and oblong.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 22

Salvia leucophylla.

The lower lip of the corolla is plane and oblong.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 23

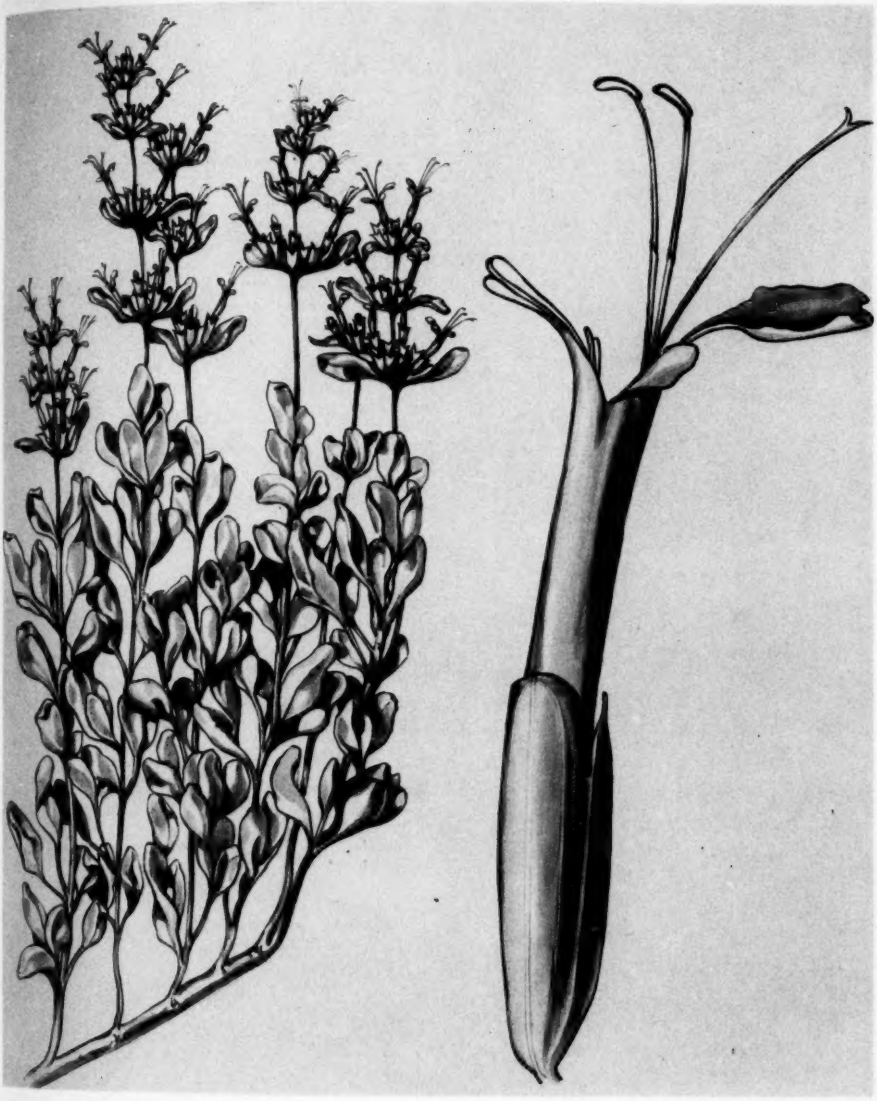
Salvia mohavensis.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 24

Salvia pachyphylla.

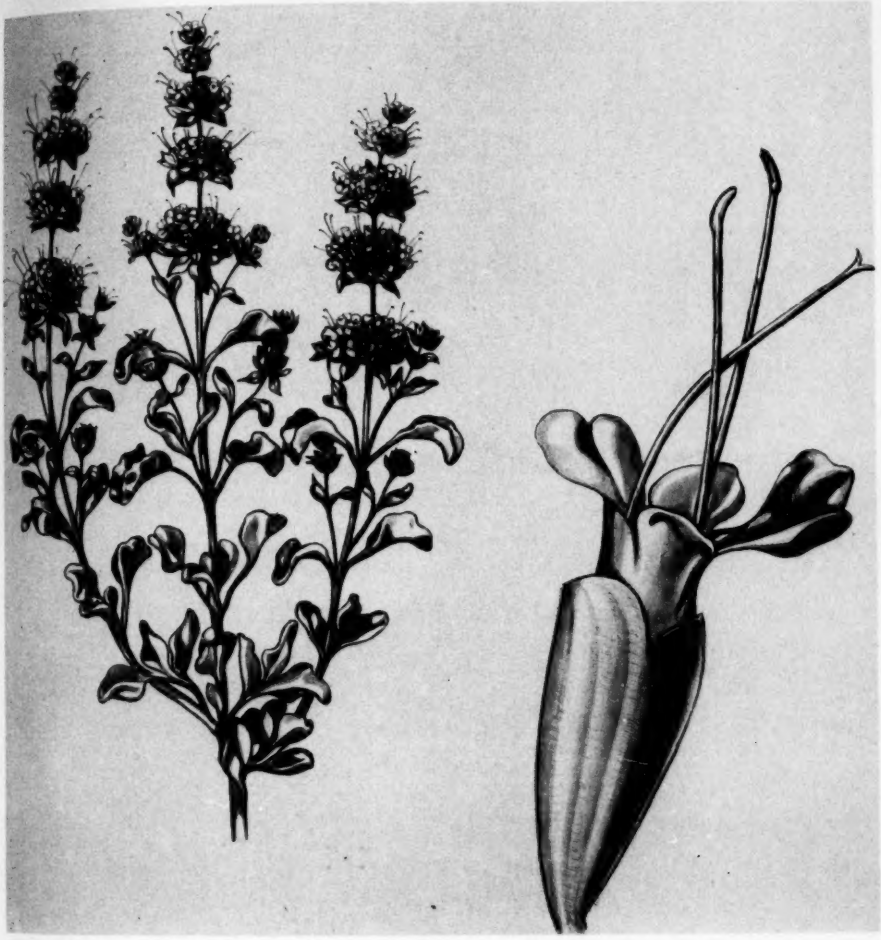


EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 25

Salvia carnosa subsp. *pilosa*.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 26

Salvia eremostachya.

The throat of the corolla is vertically compressed.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 27

Salvia sonomensis.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 28

Salvia Vaseyi.

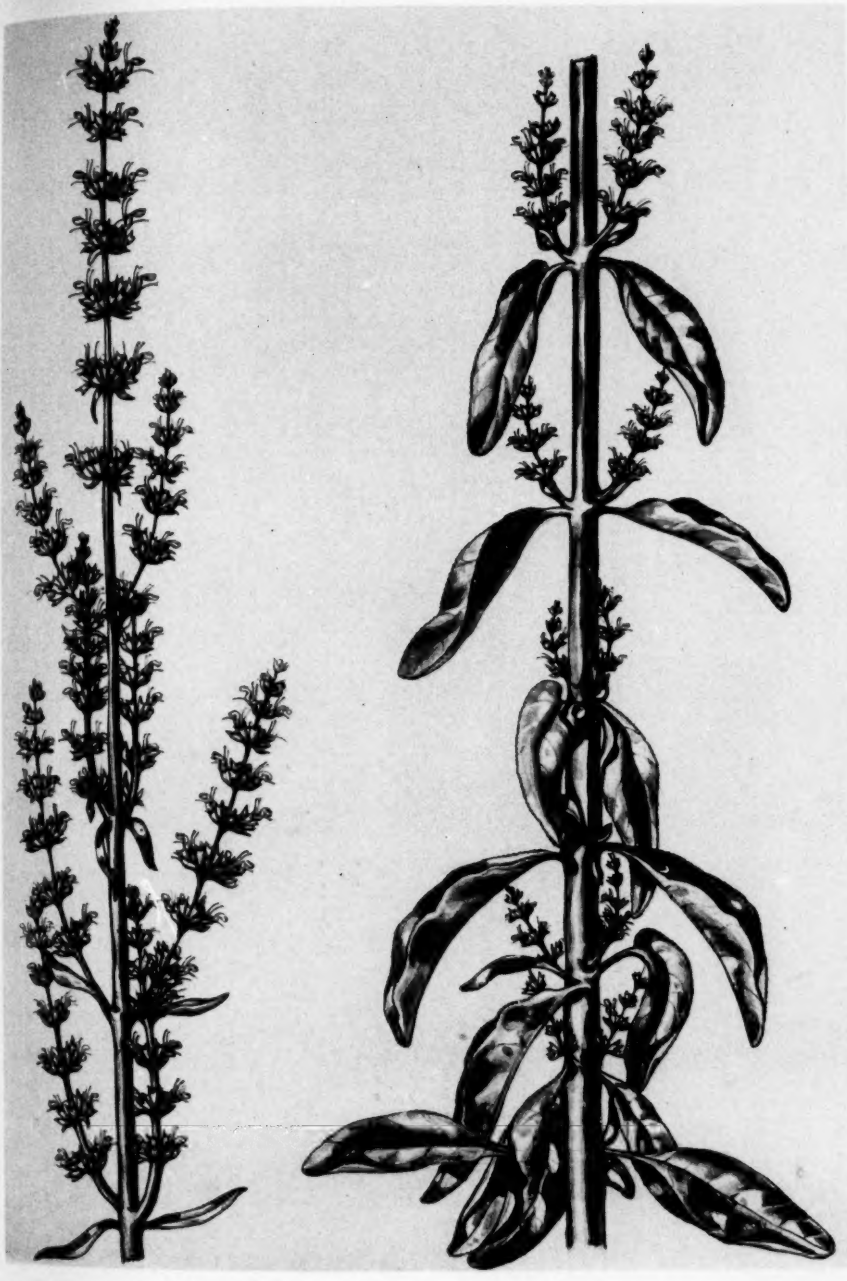
The corolla throat is vertically compressed.

EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 29

Salvia apiana.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 30

Salvia apiana.

The upper flower is characteristic of early anthesis, the lower lip later becoming reflexed as shown in the lower flower. The first position is seemingly permanent in some cases, however. The throat is more or less compressed vertically.

EPLING — THE CALIFORNIAN SALVIAS

STUDIES IN THE APOCYNACEAE. VII[1]

An Evaluation of the Genera Plumeria L. and Himatanthus Willd.

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Even a casual examination of a suite of herbarium specimens of the inclusive genus *Plumeria* will demonstrate that the representations indigenous to America roughly north and south of Panama are of very distinctive appearance. It is true that both groups are constituted of rather small to moderate-sized trees with disproportionally thick, fistulose branches and a spongy, suberized periderm; usually rather large, fleshy, spiral foliage which is very deciduous; and broad inflorescences of handsome, waxy flowers. However, the representation roughly from Panama northward, including two species in northern South America, but particularly abundant in Central America, southern Mexico, tip of peninsular Florida, and the Antilles proper, including the Bahama Islands, and that of South America, from Panama to southern Brazil, are distinguishable at a glance because of the large, petalaceous bracts of the latter.

It has long been known as well that the northern species are characterized by a regular calyx of five equal to subequal lobes, whilst the calyx of the southern species either is not manifest, or is composed of two to five minute appendages of very unequal size and shape. The stems of the northern species also are more swollen, but with lighter wood than those of the southern, which make plants of the two groups easily distinguishable in the field, even when without either flowers or foliage, a condition which frequently occurs. Because of its extreme light-

[1] Issued December 27, 1937.

ness, the wood of the northern species is not valuable commercially, whilst that of the southern species constitutes the timber known as "Sucuúba" in the Amazon valley and contiguous Guiana.

Three species of *Plumeria* were known to Linnaeus, who retained the name from Tournefort: *P. rubra* (Sp. Pl. ed. 1. 1: 209. 1753), *P. alba* (ibid. 210), and *P. obtusa* (ibid.). All three are of the northern group, and are inhabitants of Central America and the Antilles. It is strange, therefore, with the typical element of the genus so well indicated, that so careful a student as Mueller-Argoviensis (in Mart. Fl. Bras. 6^1: 42. 1860) should have considered the large-bracted species typical, and should have suggested that the small-bracted species might constitute a genus separate from *Plumeria!* This confusion was repeated more recently by K. Schumann (in Engl. & Prantl, Nat. Pflanzenfam. 4^2: 136. 1895), who grouped both the small-bracted northern species and the large-bracted southern species under the division "Bracteen gross, leicht abfallend. . ." in his key to the species contained in the 'Naturlichen Pflanzenfamilien.'

In the meanwhile the name *Himatanthus* Willd. had been proposed in Roemer & Schultes's 'Systema' in 1819, based upon a large-bracted species from northeastern Brazil, with satisfactory descriptions both generic and specific. *Himatanthus* was not known to Mueller, evidently, and was ignored by Schumann and subsequent writers as a pure synonym for *Plumeria.*

From a somewhat extended study of the North and South American representations, however, it becomes apparent that *Plumeria* and *Himatanthus* should not be considered as congeneric, since they may be distinguished by several important morphological factors as follows:

Inflorescence fastigiately thyrsiform, the secondary branches irregularly congested; bracts inconspicuous, scarious, caducous, not subtended by pectinate adaxial glands at the base; calyx-lobes always manifest, essentially equal, the tips obtuse to very shortly acuminate, always glandular; ventral loculi of the anthers conspicuously protuberant at the base; seeds provided with an eccentric, basal wing.....PLUMERIA

Inflorescence rather regularly thyrsiform, the secondary branches alternate and relatively distant; bracts large and showy, petalaceous or foliaceous, caducous, subtended by numerous minute, pectinate, adaxial glands at the base; calyx-lobes very irregular in size, gradually acuminate and not glandular at the tip, or the calyx not manifest; ventral loculi of the anthers not protuberant; seeds provided with a broad, more or less concentric, papery wing ..... HIMATANTHUS

Of the characters mentioned above, perhaps the only one which requires special discussion is the glandular character of the calyx of *Plumeria*, the calyx-lobes being found with the naked eye to be somewhat discolored and "sticky" at the tip. When examined in section by means of the compound microscope, the epidermal cells of the calyx tip are found to be elongated horizontally, and to have other histological and cytological characteristics of secretory tissues, such as those of the calycine "squamellae" of numerous other Apocynaceae, which are lacking in both *Plumeria* and *Himatanthus*.

At this juncture it may not be amiss to accentuate again that the distributions of *Plumeria* and *Himatanthus* are not strictly separated by arbitrary boundaries, as both occur somewhat sparingly in eastern Panama, and in Colombia, Venezuela, and the Guianas. However, the distribution of the former reaches its climax in Central America and the Greater Antilles, whilst the latter is particularly characteristic of the Amazon valley. Plants of undoubted northern affinities have been found elsewhere in South America and have been proposed as distinct species by Ruiz & Pavon, Mueller-Argoviensis, and others. But the same is true for as widely separated localities as Madagascar, the Philippine Islands, and southeastern Asia, where from a superficial observation Plumerias may appear to be spontaneous, and from whence novelties were described occasionally before it was recognized that the plants undoubtedly had escaped from early cultivation by the colonial Spanish, English, and French. At this time it may not be too late to indicate Central America as the probable provenience of these widely cultivated ornamental trees. The South American species *(Himatanthus)* have been cultivated much less than those of the North *(Plumeria)*, possibly since, although the inflores-

cence is as copious and the flowers as large, there is a marked tendency for fewer flowers to be open at one time because of the greater structural regularity of the inflorescence.

Although our knowledge of the botany of tropical America still is deplorably scant, it appears possible upon our present herbarium representation to offer a tentative revision of the species of both *Plumeria* and *Himatanthus* incidental to a reformation of the genera. Even though limited in scope, such an evaluation should be of considerable aid to those who find the attenuated specific distinctions of Mueller, Britton, Urban, and others of little practical value in the classification of their specimens of the inclusive genus *Plumeria*.

I am very grateful to have had the opportunity of examining specimens of *Plumeria* and *Himatanthus* from several of the more important American and European herbaria. Since these genera are very poorly known, particularly in South America, exsiccatae have been freely cited by means of the following symbols: Botanischer Garten zu Berlin-Dahlem (B); Herbier Boissier (BB) and Herbier Delessert (D), Conservatoire Botanique, Geneva; Field Museum of Natural History, Chicago (FM); Gray Herbarium of Harvard University, Cambridge, Mass. (G); Botanisches Museum, Munich (M); Missouri Botanical Garden, St. Louis (MBG); Muséum National de l'Histoire Naturelle, Paris (MP); New York Botanical Garden, New York City (NY); Naturhistoriska Riksmuseum, Stockholm (S); Botanisch Museum, Rijks Universiteit, Utrecht (U); United States National Herbarium, Washington (US); Naturhistorisches Museum, Vienna (V). I wish to express my appreciation to the various curators and directors, and particularly to Dr. L. Diels and Dr. Fr. Markgraf, who located the type specimen of *Himatanthus* in the herbarium of Willdenow, and sent it to me for examination.

Himatanthus Willd. char. emend.

Himatanthus Willd. ex R. & S. Syst. 5: 221. 1819.

Lactescent trees of small or medium stature. Stem essentially terete, usually with a rather broad pith becoming fistu-

lose, with fairly heavy wood, and rimose, flaky periderm scarred by the spiral cicatrices of fallen foliage; branches alternate to dichotomous. Leaves alternate, petiolate to sessile, penninerved, eglandular. Inflorescence terminal or pseudolateral, rather regularly thyrsiform, the secondary peduncles alternate and usually rather distant, bearing several to numerous handsome, white flowers, very conspicuously bracteate. Bracts large and showy, more or less petalaceous or foliaceous, caducous, bearing within numerous minute, persistent, pectinate, interpetiolar glands. Calyx essentially obsolete or consisting of 1–5 acute to acuminate, eglandular lobes of very unequal length and inconstant size, cleft nearly to the receptacle and never closely imbricated, without squamellae. Corolla salverform, the tube essentially straight, inappendiculate within, the limb actinomorphic, 5-parted, sinistrorsely convolute. Stamens 5, the anthers separate and free from the stigma, consisting of 2 wholly fertile, uniform thecae without protuberant bases; pollen granular. Carpels 2, strikingly subinferior, united at the apex by a common fusiform, 2-apiculate stigma; ovules many, several-seriate, borne upon an axile placenta which becomes corky and deciduous in the fruit. Nectaries absent. Follicles 2, apocarpous, usually somewhat compressed, dehiscing along the ventral suture, containing many dry, compressed, more or less concentrically winged seeds.

Type species: *Himatanthus articulata* (Vahl) Woodson, comb. nov. (*Plumeria articulata* Vahl, Eclog. Amer. 2: 20. 1798; *Himatanthus rigida* Willd. ex R. & S. Syst. 5: 221. 1819).

Trees of *Himatanthus* apparently vary considerably in height, collectors of flowering material reporting approximate dimensions from one to thirty meters. The boles are predominantly quite slender, however, and even the tallest specimens are said to attain but approximately 30 cm. near the base. The leaves vary considerably in size, ranging from 4 to 20 cm. in length within single species. As in the closely related genus *Plumeria*, the leaves apparently persist for only a relatively short time and occur chiefly toward the ends of the smaller branches. Unlike *Plumeria*, however, flowering specimens apparently never are found in a completely leafless condition.

The flowers are showy, invariably white in color, and of a rather waxy texture, as in *Plumeria*. Collectors report them to be pleasingly fragrant. The complete length of the corolla varies in general from 3 to 6 cm., the obovate to obovate-oblong lobes about equalling the length of the tube, which is predominantly 0.2 cm. in diameter at the base. The flowers are borne in a cincinnous manner at the swollen nodes of the compound inflorescence. At each node, ensheathing the secondary peduncle and the paired flowers, are borne two petalaceous, rather canaliculate, caducous bracts, which measure from 1 to 2.5 cm. in length, somewhat recalling the glumes of a grass spikelet, greatly enlarged.

The follicles are relatively broad, acuminate, and slightly, if at all, compressed. The length varies from as little as 6 cm. in *H. attenuata* to a maximum of 24 cm. in *H. articulata*. The seeds are greatly compressed, and are provided with a rather broad, more or less concentric, papery wing, much as those of the genus *Aspidosperma*. The seeds, which have a persistent endosperm (unlike those of *Aspidosperma)*, are peltately affixed to the placenta, and are predominantly broadly ovate, varying from 2 to 8 cm. in length. At dehiscence of the follicle the placenta is shed with the seeds, and is found to be a most peculiar, corky, fusiform structure, as in *Plumeria*, ranging from 3 to 20 cm. in length, and from 0.7– to 1.5 cm. in diameter.

The large-bracted species of the inclusive genus *Plumeria*, which are now being relegated to *Himatanthus*, are an extremely difficult subject for taxonomic study at the present time. Apparently never abundant in the forest vegetation, but relatively few exsiccatae are available for study. The paucity of specimens obviously renders an evaluation of interspecific variability quite fallible: consequently the formulation of detailed descriptions in a study of this nature is impractical.

Under such conditions, the apparent absence of well-defined taxonomic criteria is particularly exasperating. Flower structure, including the anthers and stigmata, appears to offer no distinctions of merit which can be tested adequately from the present representation; and fruiting material is scant or lacking for the species. The calyx, which has been relied upon for

criteria by such investigators as Mueller-Argoviensis and Markgraf, is particularly inconstant.

The best indicators of relationship would appear to be the venation, texture, and shape of the leaves, notwithstanding the opinions of K. Schumann (in Engl. & Prantl, Nat. Pflanzenfam. 4^2: 136. 1895) and Markgraf (in Pulle, Fl. Surinam **4**: 17. 1932). Although leaf characters have been employed almost exclusively in this purely tentative treatment, it probably is inevitable that their use may have to be modified greatly as additional material, so greatly needed, finds its way into our collections. It should be borne in mind by those who attempt to use the following key that it is offered quite provisionally, and is designed merely as a basis for the re-establishment of the genus *Himatanthus*.

KEY TO THE SPECIES

a. Netted tertiary venation of leaves fine and dense, conspicuously verrucose in virtually its entirety upon the upper surface in desiccation.
  b. Leaves lustrous, particularly above, the secondary venation relatively distant and broadly arcuate, the marginal vein rather poorly developed, deeply and irregularly sinuous.....*1. H. articulata*
  bb. Leaves usually opaque, the secondary venation relatively close and essentially rectilinear, the marginal vein well developed and only very slightly sinuous.....*2. H. attenuata*
aa. Netted tertiary venation of leaves fairly irregular and distant, more or less obscure upon the upper surface in desiccation.
  b. Leaves manifestly petiolate, invariably glabrous.
    c. Leaves firmly membranaceous to subcoriaceous, obovate-elliptic to oblanceolate-oblong.
      d. Leaves broadest somewhat above the middle, tapering rather gradually, or obtuse; inflorescence corymbose or subcorymbose.....*3. H. Sucuuba*
      dd. Leaves broadest near the tip, tapering rather abruptly, or broadly obtuse to rounded; inflorescence pyramidal.
        e. Leaves more or less broadly obovate-elliptic, three to four times as long as broad, the tip obtuse or rounded to very shortly and obtusely acuminate.....*4. H. phagedaenica*
        ee. Leaves oblanceolate-oblong, four to seven times as long as broad, the tip acutely subcaudate-acuminate to obtuse....*5. H. lancifolia*
    cc. Leaves rather heavily coriaceous, broadly obovate to obovate-oblong.....*6. H. bracteata*
  bb. Leaves sessile to subsessile, occasionally more or less pubescent.....*7. H. obovata*

1. HIMATANTHUS **articulata** (Vahl) Woodson, comb. nov.
Plumeria articulata Vahl, Eclog. Amer. 2: 20. 1798; Mgf. in Pulle, Fl. Surinam **4**: 16. 1932.
Himatanthus rigida Willd. ex R. & S. Syst. **5**: 221. 1819.
Plumeria drastica Mart. in Spix & Mart. Reise Bras. **2**: 547. 1828; A. DC. in DC. Prodr. **8**: 393. 1844; Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860.
Plumeria fallax Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860.
Plumeria microcalyx Standl. Field Mus. Publ. Bot. **4**: 254. 1929.

PANAMA: SAN BLAS: Permé, April 3–10, 1928, *Cooper 642* (FM, NY, US); DARIEN: Cana and vicinity, alt. 2000–6500 ft., April 17–June 8, *Williams 823* (NY).

VENEZUELA: BOLIVAR: Ciudad Bolivar and vicinity, Febr.–March, 1921, *Bailey & Bailey 1384* (MBG); Catalina, May, 1896 *Rusby & Squires 303* (B, D, G, M, MBG, US); data incomplete, 1901–1902, *Passarge & Selwyn 835* (B).

BRITISH GUIANA: Wakefeon Creek, Pomeroon River, Oct., 1899, *Jenman 7968* (B); data incomplete, *Schomburgk 403* (B).

DUTCH GUIANA: Sandrij I., Nov. 14–25, 1934, *Archer 2793* (MBG); Sectie O (Waldreservat), date lacking, *Boschwezen 1394* (B); Brownsberg, Sept. 11, 1917, *Boschwezen 3257* (Bx, U); Boschreserve, Kaboerie, Aug. 27, 1920, *Boschwezen 4956* (B, U); data incomplete, *Hostmann (& Kappler) 1311* (D, MP, S, U, V).

FRENCH GUIANA: Reservoir Hill, Matabon, vicinity of Cayenne, July 12, 1921, *Broadway 779* (G, US); Mana, 1896, *Sagot 894* (BB, MP, S); data incomplete, 1802, *Gabriel s.n.* (D, MP).

BRAZIL: AMAZONAS: Rio Quino Igarape, Sept., 1927, *Luetzelburg 21477* (M); Igarape, Sept., 1927, *Luetzelburg 21547* (M); bei S. Marcos, Rio Branco, Jan., 1909, *Ule 7829* (B); Maues, Dec., 1928, *Jard. Bot. Rio Jan. 21609* (B, S, US); PARA: in colle Serra da Tabatinga prope Arrayollos inter Almerim et fl. Jary, April 29, 1923, *Ducke 17473* (S); Bragança, Jan. 10, 1923, *Ducke 17475* (B); Juruty Velho, Dec. 19, 1926, *Ducke 21558* (B); Santarem, July 3, 1926, *Ducke 21596* (B, US); Rio Trombetas infer., silva ad ripas inundatas Lago Salgado, Nov. 27, 1910, *Ducke 21785* (B); campos do Ariramba in reg. fl. Trombetas, Dec. 13, 1910, *Ducke 21790* (B); Aramanahy, Jan., 1932, *Monteiro da Costa 236* (MBG); Ilha do Mosqueiro, near Para, Nov. 3–9, 1929, *Küllip & Smith 30660* (MBG, US); sylvis ad Para, May, year lacking, *Martius s.n.* (M); in vicinibus Santarem, Nov.–Mart., 1849–50, *Spruce 231* (B, G, M); Municipality of São Paulo de Olivença, basin of creek Belem, Oct. 26–Dec. 11, 1936, *Krukoff 8786* (NY); MARANHAO: Maracassume River region, July 12, 1932, *Froes 1777* (D, MBG, S); Insula Manguneca, prope Cururupu, Aug., 1914, *Lisboa 4785* (B, BB, S, US); ALAGOAS: Maceio-Penedo, alt. 100 m., March, 1932, *Werdermann 3020* (B); BAHIA: Serra do Sao Ignacio, Febr., 1907, *Ule 7205* (B); Rio Preto, date lacking, *Zehntner 2082* (M); GOYAZ: Cam-

pinas, bei Duro, 1913, *Luetzelburg 639* (M); DATA INCOMPLETE: "Habitat in interioribus prov. Minarum et Bahiensis ad Caitete, Malhada, Salgado aliisque locis," date lacking, *Martius s.n.* (M).

Occasionally the leaves of this species approach the subsessile condition of those of *H. obovata,* from which they may be distinguished, however, by the lustrous upper surface with its characteristically verrucose venation.

H. articulata forms rather slender trees 5 to 25 m. tall. Popular names are reported as "Santo Maria" (Bailey & Bailey), "Sucuúba" (Ducke, Huber), and "Jauahuba" (Lisboa).

2. HIMATANTHUS **attenuata** (Benth.) Woodson, comb. nov.

Plumeria attenuata Benth. in Hook. Jour. Bot. **3**: 245. 1841; A. DC. in DC. Prodr. **8**: 393. 1844; Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 42. 1860.

Plumeria angustiflora Spruce, ex Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 42. 1860, nom. nud. in synon.

Plumeria attenuata Benth. β. *obtusifolia* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 42. 1860.

Plumeria attenuata Benth. γ. *Malongo* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 42. 1860.

Plumeria Malongo Spruce, ex Muell.-Arg. Fl. Bras. **6**[1]: 42. 1860, nom. nud. in synon.

BRASIL: AMAZONAS: Ilha de Jerusalem, Rio Negro, near mouth of Rio Cauabury, Dec. 18, 1930, *Holt & Blake 561* (MBG, S, US); along Rio Negro, above Manaos, alt. 25 m., Oct. 14, 1929, *Killip & Smith 30029* (MBG, US); Uypiranga prope Manaos, Dec. 21, 1923, *Kuhlmann 21864* (B); in sylvis japurensibus, Dec.–Jan., year lacking, *Martius s.n.* (M); Ufer am Igarape, Manaos, Aug. 28, 1922, *Raymundo 22088* (M); Rio Trombetas, Dec., 1849, *Spruce 539* (MP); in vicinibus Barra, Dec.–Mart., 1850–51, *Spruce 1004* (B, D, G, M, MP, ISOTYPES); prope Panure, Rio Uaupes, Dec., 1852, *Spruce 2764* (Bx, MP); Cachoeira Grande, bei Manaos, Aug., 1910, *Ule 8951* (B, D); Maues, ad ripas fluminis, Dec., 1928, *Jard. Bot. Rio Jan. 21608* (B, BB, S, US); PARA: Lago de Faro, ripis inundatis, Jan. 4, 1920, *Ducke 11401* (B); ad ripas fluminis das Trombetas et lacus Quiriquiry, Dec., 1849, *Spruce 230* (M); ESPIRITO SANTO: data incomplete, *Glaziou 9938* (MP).

Popular names of *H. attenuata* are reported as "Malongo" (Spruce) and "Sucuuba-rana" (Ducke). This species consists of slender trees 6–10 m. in height.

3. HIMATANTHUS **Sucuuba** (Spruce) Woodson, comb. nov.

Plumeria Sucuuba Spruce, ex Muell.-Arg. in Mart. Fl. Bras. 6[1]: 40. 1860.

Plumeria floribunda Muell.-Arg. in Mart. Fl. Bras. 6[1]: 40. 1860.

Plumeria tarapotensis K. Sch. ex Mgf. Notizblatt 11: 339. 1932.

PERU: JUNIN: Perene, Chanchamayo, Paucartambo, 1920, *Nordenskjold & Rospigliosi s.n.* (B); in Chanchamayo-Thal, Prov. Tarma, Dec., 1902, *Weberbauer 1927* (B); LORETO: Yurimaguas, lower Rio Huallaga, alt. 135 m., Aug. 22–Sept. 9, 1929, *Killip & Smith 27606* (MBG, US); Mishuyacu, near Iquitos, alt. 100 m., Oct.–Nov., 1929, *Klug 230* (US); Tocache, Huallaga, 1830, *Poeppig s.n.* (V); Chicoplaya, date lacking, *Tafalla s.n.* (B); Stromgebiet des Ucayali von 10° bis zur Mündung, Sept. 20, 1923, *Tessmann 3205* (B, D); Stromgebiet des Maranon von Iquitos aufwärts bis zur Santiago-Mündung am Pongo de Manseriche, Aug. 29, 1924, *Tessmann 3903* (B, D); Yurimaguas, March 18, 1926, *Tessmann 5512* (B, S); Tarapoto, Oct., 1902, *Ule 6473* (B, D); Rioja (westl. von Moyobamba), Sept. 8, 1904, *Weberbauer 4701* (B, D); lower Rio Huallaga, alt. 155–210 m., Oct.–Nov., 1929, *Williams 3988* (US); SAN MARTIN: alto Rio Huallaga, Dec., 1929, *Williams 6559* (MBG).

BOLIVIA: BENI: Rurrenabaque, alt. 1000 ft., June 1–7, 1921, *Rusby 1558* (US); LA PAZ: Tipuani-Guanai, Dec., 1892, *Bang 1679* (B, BB, D, G, M, MBG, NY, US); Tumupasa, Dec. 10, 1901, *Williams 401* (US); SANTA CRUZ: Montes de Buenavista, Prov. Sara, April 23, 1916, *Steinbach 2048* (B); Rio Surutu, Prov. Sara, Dec. 27, 1924, *Steinbach 6827* (B, D, MBG, S).

BRAZIL: AMAZONAS: Manaos, Dec. 8, 1927, *Ducke 21606* (B); Rio Jauary, Oct. 20, 1927, *Ducke 21607* (B, US); Municipality Humayta, on plateau between Rio Livramento and Rio Ipixuna, Nov. 7–18, 1934, *Krukoff 7195* (MBG); near mouth of Rio Embira (tributary of Rio Tarauca), June 13, 1933, *Krukoff 4787* (FM, NY); Municipality São Paulo de Olivença, June, 1936, *Krukoff 7846* (NY); near Palmares, Municipality São Paulo de Olivença, Sept. 11–Oct. 26, 1936, *Krukoff 8413* (NY); basin of creek Belem, Municipality of São Paulo de Olivença, Oct. 26–Dec. 11, 1936, *Krukoff 8926* (NY); Ega, date lacking, *Martius s.n.* (M); prope Barra, Oct., 1851, *Spruce 1848* (B, Bx, TYPE, G, MP); Panure, Maupes, date lacking, *Spruce 2794* (MP); Manaos, Jan., 1901, *Ule 5385* (B, D); MATTO GROSSO: near Tabajara, upper Machado River region, Nov., Dec., 1931, *Krukoff 1463* (B, D); PARA: Rio Erepecuru, affl. Trombetas, ad ripas cataractae Cachoeira Troneo, Oct. 20, 1913, *Ducke 21783* (B); ACRE: near mouth of Rio Macauhan (tributary of Rio Yaco), Aug. 29, 1933, *Krukoff 5689* (FM, NY).

Trees of this species are said to attain a height of 30 m. (Krukoff), although other collectors report flowering specimens of only 2 m. Popular names are reported as "Sucuuba"

(Spruce, Krukoff), "Cipoal" (Krukoff), "Leche-leche" (Steinbach), and "Bellaku-Kaspi" (Tessmann).

4. HIMATANTHUS **phagedaenica** (Mart.) Woodson, comb. nov.

Plumeria phagedaenica Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831; A. DC. in DC. Prodr. **8**: 394. 1844; Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 37. 1860; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**[2]: 136. 1895.

Plumeria ambigua Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 37. 1860.

Plumeria Martii Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 37. 1860.

Plumeria speciosa Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 36. 1860; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**[2]: 136. 1895.

Plumeria floribunda Muell.-Arg. β. *crassipes* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860.

Plumeria floribunda Muell.-Arg. γ. *calycina* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 41. 1860.

Plumeria floribunda Muell.-Arg. δ. *acutifolia* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 41. 1860.

Plumeria fallax Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860, as to specimens cited, in part.

Plumeria lancifolia Muell.-Arg. β. *major* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 41. 1860.

Plumeria lancifolia Muell.-Arg. γ. *microphylla* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 41. 1860.

BRAZIL: AMAZONAS: sylvis ad Rio Cachoeira prope Barra do Rio Negro, Oct., year lacking, *Martius 2778* (M, TYPE); PERNAMBUCO: Tapera, Jan., 1929, *Pickel 1882* (B); Cajueiro nordwestl. Recife, c. 100 m. alt., Febr., 1932, *Werdermann 2785* (B); data incomplete, *Ridley Lea & Ramage s.n.* (B, S); BAHIA: sylvis Catingas ad Feira de Conceiçao, Febr.–Mart., year lacking, *Martius 2252* (M); Vittoria-Bahia, date lacking, *Sello s.n.* (B); data incomplete, *Blanchet 223* (D, MP); *Blanchet 929* (D); *Lhotsky 4* (B); MINAS GERAES: data incomplete, 1831, *Ackermann s.n.* (Bx); RIO DE JANEIRO: data incomplete, *Glaziou 11175* (B); DATA INCOMPLETE: *Ackermann s.n.* (B); *Link s.n.* (B); *Pohl s.n.* (Bx); *Sello 32* (Bx); *Sello s.n.* (B).

Reported by collectors to form high trees.

5. HIMATANTHUS **lancifolia** (Muell.-Arg.) Woodson, comb. nov.

Plumeria lancifolia Muell.-Arg. in Mart. Fl. Bras. 6[1]: 41. 1860.

Plumeria lancifolia Muell.-Arg. β. *major* Muell.-Arg. in Mart. Fl. Bras. 6[1]: 41. 1860, as to specimens cited, in part.

BRAZIL: ESPIRITO SANTO: Rio Doce, Febr., 1907, *Luetzelburg 7222* (M); MINAS GERAES: Serra dos Vertentes, près Oliveira, Aug. 22, 1882, *Glaziou 14069* (B, MP); s.e. corner of Agricultural College grounds, Viçosa, alt. 590 m., Dec. 19, 1929, *Mexia 4136* (MBG); hill northwest of director's house, alt. 675 m., Dec. 15, 1930, *Mexia 5408* (MBG); data incomplete, *St.-Hilaire 42* (MP); RIO DE JANEIRO: Corvocado et Pain de S., 1858, *Guillos s.n.* (MP); Vista Chineza, March, 1917, *Hoehne 24608* (B); Canta Gallo, 1859, *Peckolt 58* (Bx, TYPE); sylvarum margines per Serra do Mar, date lacking, *Martius s.n.* (M); data incomplete, *Glaziou 640* (Bx); *Mosen 2533* (S); *Widgren 828* (S, US); DATA INCOMPLETE: *Freyreiss s.n.* (S); *Glaziou 20409* (B); *Pohl 1837* (Bx); *Sello 1273* (B).

I suspect that this species may ultimately prove to be but a variety of *H. phagedaenica.*

6. HIMATANTHUS **bracteata** (A. DC.) Woodson, comb. nov.

Plumeria bracteata A. DC. in Prodr. 8: 394. 1844; Muell.-Arg. in Mart. Fl. Bras. 6[1]: 36. *pl. 11, fig. 2.* 1860.

Plumeria revoluta Huber, Bull. Soc. Bot. Genève II. 6: 200. 1915.

BRITISH GUIANA: Malali, Demerara River, Oct. 30–Nov. 5, 1922, *Cruz 2743* (G); Barima River, Northwest District, March 19–22, 1923, *Cruz 3361* (G); dry sandhills east of Rockstone, July 22–30, 1921, *Gleason 777* (G).

DUTCH GUIANA: savannah near Brownsberg, Nov. 13, 1933, *Lanjouw 1252* (B).

BRAZIL: AMAZONAS: infra cataractas Camanaos, Nov. 22, 1929, *Ducke 22404* (B); Ufer des Igarape, Oct. 6, 1928, *Luetzelburg 22351* (M); Igapo, Rio Negro, Oct. 9, 1928, *Luetzelburg 22903* (M); Fl. Uaupes, Nov., 1852, *Spruce 2721* (MP); PARA: inter Almeirim et Prainha, Oct. 6, 1919, *Ducke 11399* (B); Pampinas de l'Achipica, Rio Trombetas, Oct. 15, 1913, *Ducke 14987* (US); PERNAMBUCO: data incomplete, *Paulay s.n.* (V); BAHIA: data incomplete, *Blanchet 13* (MP, TYPE).

I suspect that *H. bracteata* and *H. articulata* hybridize in the Guianas and northeastern Brazil. Several specimens suggesting this possibility bear leaves with the texture of *H. bracteata* but with the verrucose venation of *H. articulata,* and have been assigned, consequently, to the latter species in citation.

7. HIMATANTHUS **obovata** (Muell.-Arg.) Woodson, comb. nov.

Plumeria obovata Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860.

var. **typica.**

Plumeria Warmingii Muell.-Arg. in Warming, Kjoeb. Vidensk. Meddel. p. 99. 1869.

Plumeria oligoneura Malme, Arkiv f. Bot. **21A**[6]: 6. 1927 (see note below).

Plants wholly glabrous throughout.

BRAZIL: BAHIA: data incomplete, *Luschnath 190* (B); GOYAZ: data incomplete, *Glaziou 21736, in part* (B); MATTO GROSSO: Santa Ana da Chapada, Sept. 24, 1902, *Malme 2375* (S); MINAS GERAES: inter Uberava et Melancias, Nov. 29, 1848, *Regnell III 867, in part* (S, US); Lagoa Santa, 1870, *Warming s.n.* (D); data incomplete, *Claussen 330* (G, S); *St.-Hilaire 576* (MP); SAO PAULO: inter Canna Verde et S. Joao de Jaguary, May 5–8, 1848, *Regnell III 867, in part* (S); inter Franca et Uberava, July, 1848, *Regnell III 867, in part* (S); Cajuru, March, 1857, *Regnell III 867, in part* (S); DATA INCOMPLETE: *Glaziou 19628* (B, MP); *Pohl s.n.* (Bx); "S. Luzia Corumba, Villa Boa," *Pohl s.n.* (M); *Schwake 8165* (B); *Sello 1643* (B, Bx); "Bresil Central," *Weddell 2508* (MP).

BOLIVIA: data incomplete, *d'Orbigny s.n.* (MP).

var. **puberula** (Muell.-Arg.) Woodson, comb. nov.

Plumeria puberula Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860.

Plumeria velutina Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860.

Plumeria Hilariana Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860.

Plumieria latifolia Pilger, in Engl. Bot. Jahrb. **30**: 183. 1901.

Leaves and young stem more or less densely velutinous-puberulent to glabrate.

BRAZIL: GOYAZ: central plateau, 1894–95, *Glaziou 21736, in part* (D); MATTO GROSSO: Cuyaba, Nov., 1893, *Malme 1120* (S); same place, July 4, 1902, *Malme s.n.* (S); Serradao bei Cuyaba, Febr. 15–20, 1899, *Pilger 198* (B); MINAS GERAES: data incomplete, 1816–1821, *St.-Hilaire s.n.* (MP).

The type specimen of *Plumeria oligoneura* Malme *(Malme 2375,* in herb. Stockholm) suggests hybridity with *H. Sucuuba,* since the leaves have short petioles, venation much as in *H.*

Sucuuba, and general outline intermediate between *Sucuuba* and *obovata.* The specimen certainly is not worthy of specific rank upon the basis of our present knowledge of the genus.

PLUMERIA L. char. emend.

Plumeria [Tourn.] L. Sp. Pl. ed. 1. **1**: 209. 1753; Gen. Pl. ed. 5. 99. 1754; A. DC. in DC. Prodr. **8**: 389. 1844, in part; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895, in part; Britton, Bull. Torrey Bot. Club **42**: 503. 1915.

Lactescent trees of small or medium stature. Stems terete or essentially so, usually with a broad pith becoming fistulose, with light wood and rimose, corky periderm scarred by the spiral cicatrices of fallen leaves; branches dichotomous to alternate. Leaves alternate, petiolate to sessile or subsessile, penninerved, eglandular. Inflorescence terminal or pseudolateral, fastigiately thyrsiform, usually greatly congested, bearing few to numerous handsome flowers, very inconspicuously bracteate. Bracts small, scarious, caducous. Calyx 5-parted, the lobes equal to subequal, cleft nearly to the receptacle, closely imbricated, glandular at the tips, but without squamellae at the base within. Corolla salverform, the tube essentially straight, exappendiculate within, the limb actinomorphic, 5-parted, sinistrorsely convolute. Stamens 5, the anthers separate and free from the stigma, consisting of 2 wholly fertile, basally protuberant thecae; pollen granular. Carpels 2, strikingly subinferior, united at the apex by a common, fusiform, 2-apiculate stigma; ovules many, several-seriate, borne upon an axile placenta which becomes corky and deciduous in the fruit. Nectaries absent. Follicles 2, apocarpous, stout, terete or essentially so, dehiscing along the ventral suture, containing many dry, compressed, basally winged seeds.

Type species: *Plumeria rubra* L. Sp. Pl. ed. 1. **1**: 209. 1753.

Founded as a tribute to Charles Plumier, the pioneer systematist of the tropical New World flora, the genus was spelled *Plumeria* by both Tournefort and Linnaeus, as well as by such subsequent authors as A. de Candolle, Bentham, and Baillon. The spelling *Plumiera* also was used by Linnaeus,

however, in the 'Philosophia' (31. 1751), and followed by Adanson, C. Kuntze, and K. Schumann, influenced doubtless by Burmann's Latinization of the personal name of the illustrous Minim as "Plumierius." A still further change to *Plumieria* was made by Scopoli (Introd. 155. 1777). Use of all three variants has been widespread, even by a single author. More recently Urban (in Fedde, Repert. Spec. Nov. **14**: 341. 1916) has come to the defense of the original spelling *Plumeria*, pointing out that it has both priority and the sanction of correct etymology, since the correct Latinization of Plumier's name should be "Plumerius."

An evaluation of the species of *Plumeria* by students unable to gain an extensive knowledge of the plants in the field, among whom the present writer must be counted, is attended by several difficulties. The first of these is the paucity of morphological characters in the flowers and fruits, the relatively few of which have been either unknown to most authors, or ignored by them.

The color of the corolla apparently is always white "with a yellow eye" in the species indigenous to the Antilles and northern South America. But the inclusive *P. rubra* L. (as interpreted in this revision), which is supposedly the only species indigenous to Central America, demonstrates a bewildering variety of flower color ranging from pure white to uniform deep yellow or rose, together with various combinations of shades. This diversity has prompted specific segregation to a surprising extent, since the plants have been admired so greatly and are so frequent in cultivation. To the present writer, however, color variations in *P. rubra* are certainly not specific, because of the lack of accompanying characters; and such segregation is rendered extremely impractical as well by the loss or change of flower color in desiccation. In the revision which follows a few outstanding color variations are accorded formal rank for the use of those who desire some distinction in the matter.

In the absence of other morphological characters, several authors, notably Britton and Urban, have attempted extensive segregation of the Plumerias of the Antilles upon the bases of

leaf shape, size, and indument, which certainly are extremely diversified within certain limits. A difficulty encountered in such characters is that the foliage is very deciduous, rendering herbarium specimens imperfect in a surprising number of cases. Then too, Plumerias are very prone to bloom in a leafless condition.

There can be little doubt that the leaf outline of the Antillean species of *Plumeria* is much more variable than the describers of some species apparently have realized. If one arranges in a single series a suite of leaves each of which has been taken from type specimens of as many species from the *P. obtusa* L. complex described by Grisebach, Urban, Britton, and others, the difficulty of segregation upon such characters at once becomes apparent. Hence slight variations in leaf outline have been discounted greatly in the present revision. Since the presence or absence of indument is a character easily perceived and in favor with those who prefer their taxonomic entities "cut fine," *P. obtusa* has been divided into a glabrous variety and one which is more or less pubescent upon the lower leaf surface, but this also with reluctance.

Although known under a variety of aboriginal names, the most widespread popular name for the cultivated Plumerias in use by Europeans is "Frangipani" or "Frangipanier." Sir J. J. Smith (in Rees, 'Cyclopaedia,' 1810) discusses the provenience of this name as follows: "The French name of this genus, *Frangipanier,* is rather remarkable. It is said to allude to its fragrance, *Frangipani* being a sort of perfume so-called in France from its inventor, an Italian, of the Frangipani family, so conspicuous in the Roman disturbances of the twelfth century." The odor was described by Jacquin as being "perhaps the sweetest of any plant living," well-merited praise, although individuals occasionally are encountered which are practically scentless. The fragrance, as well as the abundance of waxy, beautifully tinted flowers, apparently caused the Plumerias to be prized by the Indians long before the advent of the Spaniards, and garlands are still used in tropical America as nosegays and head-dresses and to decorate altars. Transplanted by admiring Europeans, *P. rubra* now is found

in cultivation throughout the world's tropics, vying in popularity even with the ubiquitous *Nerium Oleander*.

KEY TO THE SPECIES

a. Corolla subinfundibuliform, the tube gradually dilating above the insertion of the stamens to an orifice about twice the diameter of the base.
  b. Leaves definitely petiolate, obovate-elliptic to oblanceolate, not pandurate or cochleate; corolla-lobes fully contorted in the bud, strikingly spiral in aestivation; Colombia; British Guiana.....*1. P. inodora*
  bb. Leaves subsessile, obovate-oblong, more or less pandurate or cochleate; corolla-lobes about half convolute in the bud, longitudinal in aestivation, or scarcely spiral; Colombia; Venezuela; Martinique....*2. P. pudica*
aa. Corolla strictly salverform, the orifice of the tube about equalling the diameter of the base, or slightly narrower.
  b. Secondary venation of leaves entering the midrib at a more or less conspicuously decurrent, narrowly acute angle, at least in part; aestivation of corolla-lobes conspicuously spiral.
    c. Leaves conspicuously petiolate, subcoriaceous, with a conspicuous marginal vein, secondary and tertiary venation more or less immersed upon the upper surface; flowers white, yellow, rose, or particolored; Central America generally, frequently cultivated in the Antilles, South America, and elsewhere in the tropics and subtropics...*3. P. rubra*
    cc. Leaves subsessile, membranaceous, without a well-developed marginal vein, secondary and tertiary venation extremely pronounced upon both surfaces; flowers white "with a yellow eye"; Hispaniola.....*7. P. subsessilis*
  bb. Secondary venation of leaves entering the midrib directly; aestivation of corolla-lobes longitudinal, or scarcely spiral.
    c. Leaves obovate to obovate-oblong, rounded, emarginate, or very broadly obtuse at the apex, rarely very shortly and abruptly acuminate-submucronulate, coriaceous to subcoriaceous, rarely firmly membranaceous, secondary veins anastomosing distally to form a well-developed marginal vein; Bahama Islands; Cuba; Hispaniola; Jamaica; Puerto Rico; locally in Yucatan and British Honduras.....*4. P. obtusa*
    cc. Leaves lanceolate or oblong-lanceolate to subfiliform, narrowly and gradually acute to acuminate at the apex, firmly membranaceous to subcoriaceous, secondary veins anastomosing distally but not forming a well-developed marginal vein.
      d. Leaves linear-lanceolate to subfiliform, 0.1–1.0 cm. broad, firmly membranaceous, wholly glabrous; Cuba.....*5. P. filifolia*
      dd. Leaves lanceolate to oblong-lanceolate, 1–4 cm. broad, subcoriaceous, the margins very characteristically "puckered-revolute" in desiccation, usually densely pubescent beneath; Puerto Rico; Virgin Islands; Lesser Antilles.....*6. P. alba*

(Attention is called to the discussion of hybridization, as an aid to the determination of anomalous specimens, particularly those of Hispaniola.)

1. PLUMERIA INODORA Jacq. Select. Stirp. Amer. Hist. 1: 36. 1763.

Plumeria alba L. var. β. *fragrans* HBK. Nov. Gen. 3: 230. 1819.

Plumiera alba L. var. *fragrantissima* G. Don, Gen. Hist. 4: 94. 1838.

Plumiera alba L. var. *inodora* (Jacq.) G. Don, Gen. Hist. 4: 94. 1838.

COLOMBIA: EL VALLE DE CAUCA: Rio Bugalagrande, Central Cordillera, alt. 1400 m., June 15, 1930, *Dryander 425* (B); CUNDINAMARCA: Girardot, July, 1930, *Arbelaez 358* (US); MAGDALENA: Barranquilla and vicinity, Usiacuri, alt. 250 m., July, 1927, *Elias 269* (MBG, US); Santo Tomas, July, 1932, *Elias 1009* (FM, MBG, US); Santa Marta, April 11, 1926, *Schultze 319* (B); Santa Marta, 1898–1899, *Smith 1650* (D, MBG, US).

BRITISH GUIANA: Assakatta, Northwest District, Sept. 18–28, 1923, *Cruz 4285* (FM, G); Comaca, Moruka River, Pomeroon District, Aug. 26, 1921, *Cruz 1068* (G).

The resurrection of Jacquin's *P. inodora* at this late date undoubtedly is difficult, since authentic herbarium specimens are unavailable. However, the short original diagnosis of plants growing at Cartagena appears to apply fairly well to our plants, and the statement "folia Plumeriae rubrae; flores congeneribus duplo majores" has particular bearing, as plants referable to *P. inodora* as interpreted here almost invariably have been relegated to *P. rubra,* even by certain specialists in Apocynaceae. Bro. Elias reports the common name in Colombia as "Florón."

2. PLUMERIA PUDICA Jacq. Select. Stirp. Amer. Hist. 1: 37. 1763.

Plumiera caracasana Johnston, Contr. U. S. Nat. Herb. 12: 108. 1908.

Plumeria cochleata Blake, Contr. Gray Herb. n. s. No. 53: 47. 1918.

COLOMBIA: MAGDALENA: Dibulla, between sea-level and 400 m. alt., July, 1932, *Seifriz 221* (US); Santa Marta, Aug., 1844, *Goudot s.n.* (MP).

VENEZUELA: FALCON: between Coro and Alta Gracia, May 1, 1917, *Curran & Haman 742* (G, US); vicinity of La Boca, May 1, 1917, *Curran & Haman 742A* (G); Cabo Blanco, June 11, 1917, *Curran & Haman 934* (G, US); hills of Cabo Blanco, Aug. 7, 1927, *Pittier 12426* (B, D, M, MBG, US); Cerro Sta. Ana, Para-

guana Pen., April 12, 1917, *Curran & Haman 601A* (G); DISTR. FEDERAL: La Guaira, July 13, 1900, *Robinson & Lyon s.n.* (US); between Caracas and La Guayra, alt. 1500 ft., Aug. 16, 1855, *Fendler 1026* (G); Curucuti, near Maiquetia, May 15–June, 1922, *Pittier 10353* (B, D, G, US); NUEVA ESPARTA: El Valle, Margarita, July 24, 1901, *Miller & Johnston 163* (G); same locality and date, *Miller & Johnston 100* (G, MBG, US).

MARTINIQUE: Fort de France, St. Pierre, cultivé sur les cemetières, 1885, *Duss 336* (NY, US).

Much the same difficulties attend the present interpretation of *P. pudica* Jacq. as that of *P. inodora*. In relegating the cited specimens to the former, disused almost continuously since its publication, particular emphasis has been placed upon the description of the leaves ("Folia oblonga, frondosa, plana, venosaque. . .") and the simple statement of its provenience as from Curaçao, within the general distribution of the species as here interpreted. Conscientious objection may arise in some quarters against the resurrection of a somewhat ambiguous name in place of two such as *P. caracasana* and *P. cochleata* which are established with extant type specimens; but I am personally opposed to the disregard of any name proposed in such an objective work as that of Jacquin's 'Stirpes' when any positive evidence whatsoever is available for interpretation.

3. PLUMERIA RUBRA L. Sp. Pl. ed. 1. **1**: 209. 1753; A. DC. in DC. Prodr. **8**: 390. 1844; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumeria acuminata Ait. Hort. Kew. **2**: 70. 1789; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumieria purpurea R. & P. Fl. Peruv. **2**: 20. *pl. 137.* 1799; A. DC. in DC. Prodr. **8**: 390. 1844; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumieria incarnata R. & P. Fl. Peruv. **2**: 20. *pl. 138.* 1799; A. DC. in DC. Prodr. **8**: 390. 1844.

Plumieria tricolor R. & P. Fl. Peruv. **2**: 20. *pl. 139.* 1799; A. DC. in DC. Prodr. **8**: 390. 1844.

Plumieria carinata R. & P. Fl. Peruv. **2**: 21. *pl. 140.* 1799; A. DC. in DC. Prodr. **8**: 390. 1844.

Plumieria bicolor R. & P. Fl. Peruv. **2**: 21. *pl. 141.* 1799; A. DC. in DC. Prodr. **8**: 391. 1844.

Plumieria lutea R. & P. Fl. Peruv. **2**: 21. *pl. 142.* 1799; A. DC. in DC. Prodr. **8**: 391. 1844; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumeria acutifolia Poir. Encycl. Suppl. **2**: 667. 1812; A. DC. in DC. Prodr. **8**: 392. 1844.

Plumeria mollis HBK. Nov. Gen. **3**: 230. 1819; A. DC. in DC. Prodr. **8**: 393. 1844.

Plumieria mexicana Lodd. Bot. Cab. *pl. 1024.* 1825.

Plumeria Lambertiana Lindl. Bot. Reg. *pl. 1378.* 1830; A. DC. in DC. Prodr. **8**: 391. 1844; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumeria Milleri G. Don, Gen. Hist. **4**: 93. 1838.

Plumiera arborescens G. Don, Gen. Hist. **4**: 93. 1838.

Plumiera Kerrii G. Don, Gen. Hist. **4**: 93. 1838.

Plumeria incarnata R. & P. β. *Milleri* (G. Don) A. DC. in DC. Prodr. **8**: 390. 1844.

Plumeria megaphylla A. DC. in DC. Prodr. **8**: 391. 1844.

Plumeria acutifolia Poir. β. *Gasparrini* A. DC. in DC. Prodr. **8**: 393. 1844.

Plumieria Jamesoni Hook. Bot. Mag. *pl. 4751.* 1853; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**^{2}: 136. 1895.

Plumeria loranthifolia Muell.-Arg. in Mart. Fl. Bras. **6**^{1}: 42. 1860; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. **4**: 136. 1895.

MEXICO: BAJA CALIFORNIA: San Jose del Cabo, Sept. 24, 1890, *Brandegee 358* (G, US); Valle Flojo to El Pescadero, alt. 200–500 ft., Dec. 26, 1905, *Nelson & Goldman 7351* (MBG, US); CAMPECHE: Conhuas, Febr. 23, 1932, *Lundell 1375* (NY, US); CHIAPAS: near Chicharras, alt. 6000 ft., Febr., 12–15, 1896, *Nelson 3804* (US); San Vicente, April 16, 1904, *Goldman 856* (US); CHIHUAHUA: data incomplete, 1885, *Palmer 231* (G, US); COLIMA: Colima, July 2, 1892, *Jones 351* (US); Manzanillo, March 2–18, 1891, *Palmer 1394* (G, US); GUERRERO: Las Seibas, alt. 250 m., May 24, 1898, *Langlassé 196* (B, D, G, US); Acapulco and vicinity Oct., 1894–March, 1895, *Palmer 407* (US); HIDALGO: on dry cliffs near Tula, alt. 6800 ft., May 5, 1898, *Pringle 6830* (BB, Bx, D, G, M, MBG, MP, NY, S, US); prope Huejatla, April, 1888, *Seler & Seler 662* (B, G); Ixmiquilpan, May, 1905, *Purpus 1260A* (MBG, NY); JALISCO: Chiquilistlan, May 30, 1892, *Jones 350* (MBG, US); slopes of barranca near Guadalajara, May–Sept., 1891, *Pringle 3712* (B, BB, Bx, G, M, MBG, MP, NY, S, US); Baranca, near Guadalajara, June, 1886, *Palmer 137* (BB, G, NY, US); MORELOS: lava fields near Cuer-

navaca, alt. 5000 ft., May 11, 1898, *Pringle 6866* (B, BB, Bx, D, G, M, MBG, MP, NY, S, US); prope Hacienda Gaspar, Distr. Cuernavaca, Dec., 1877, *Seler & Seler 356* (B); San Antonio, Nov. 12, *Fröderstrom & Hulten 79* (S); NAYARIT: Acaponeta, June, 1897, *Rose 1486* (G, MBG, US); OAXACA: Huanchilla, alt. 1200 m., June, 1901, *Conzatti & Gonzalez 1209* (G); Rio Seco, alt. 3300 ft., June 1, 1895, *Smith 357* (G); Cerro Caballito Blanco, alt. 1700 m., April 20, 1920, *Conzatti 3934* (US); Cuesta de Quiotepec, alt. 1100 m., April 23, 1919, *Conzatti 3554* (US); Cerro Concordia, alt. 800–1000 m., April 17, 1933, *Morton & Makrinius 2728* (US); vicinity of Comaltepec, alt. 1800–3000 ft., July 30–31, 1894, *Nelson 935* (US); six miles above Dominguillo, alt. 4500–5500 ft., Oct. 30, 1894, *Nelson 1879* (US); near Reyes, alt. 5800–6700 ft., Oct. 20, 1894, *Nelson 1779* (G); Villa Alta, Cerro de Yalina, alt. 1500 m., June, 1899, *Conzatti 962* (G); Sta. Catarina, 1910, *Olssen & Seffer s.n.* (MBG); Hacienda "Los Bocas de Concepçion," Aug. 22, 1909, *Olssen & Seffer s.n.* (MBG); PUEBLA: Santa Lucia, June, 1908, *Purpus 3240* (MBG); Tehuacan, June, 1905, *Purpus 1260* (NY); region d'Orizaba, May 12, 1865, *Bourgeau 2415* (BB, Bx, G, MP, S); QUERETARO: data incomplete, 1910–13, *Aguiel 10343* (US); SINALOA: Mazatlan, June 17–19, 1897, *Rose 1392* (US); Zapote, 1923, *Ortega 5202* (US); dry hills, vicinity of San Blas, March 22, 1910, *Rose Standley & Russell 13234* (US); SONORA: Sierra de Alamas, March 14, 1910, *Rose Standley & Russell 12852* (US); VERA CRUZ: Papantla, June, 1841, *Liebman 11911* (G, US); YUCATAN: La Vega, March 14–26, 1901, *Goldman 629* (US); forest, Chichen Itza, June 20, 1932, *Steere 1436* (MBG).

GUATEMALA: AMATITLAN: Laguna Amatitlan, alt. 3900 pp., Febr., 1890, *Smith 1920* (US); EL PROGRESO: Barranquillo, April 21, 1920, *Popenoe 981* (US); ESCUINTLA: Escuintla, alt. 1100 pp., March, 1890, *Smith 1893* (G, US); IZABAL: vicinity of Quirigua, alt. 75–225 m., May 15–31, 1922, *Standley 24318* (G, US); PETEN: occupied clearing, La Libertad, April 26, 1933, *Lundell 3023* (MBG, S); RETALHULEU: Caballo Blanco, alt. 250 pp., April, 1892, *Smith 2767* (G, US); San Felipe, alt. 2050 pp., April, 1892, *Smith 2771* (NY, US); SANTA ROSA: Santa Rosa, alt. 2500 pp., May, 1892, *Heyde & Luz 2959* (G, US); SUCHITEPEQUEZ: Cuyotenango, alt. 1100 pp., April, 1892, *Smith 2768* (G, NY, US).

HONDURAS: COMAYAGUA: cut-over valley lands, San Luis, alt. 2500 ft., May 11, 1933, *Edwards 599* (US); SANTA BARBARA: San Pedro Sula, alt. 1200 pp., Aug., 1888, *Thieme 5344* (B, BB, D, G, M, NY, US).

BRITISH HONDURAS: Roaring Creek, Aug., 1929, *Lundell 468* (MBG, US); El Cayo and vicinity, March–June, 1933, *Chanek 37* (MBG).

EL SALVADOR: vicinity of San Salvador, alt. 650–850 m., March 30–April 24, 1922, *Standley 23617* (NY, US); Huizucar, April, 1929, *Calderon 2527* (FM, US).

NICARAGUA: CHINANDEGA: Chinandega, Jan. 20, 1903, *Baker 69* (G, US); GRANADA: env. de Granada, Febr., 1870, *Levy 427* (BB, D); MANAGUA: Momotombo, June, 1895, *Smith 139* (G, MBG, NY, US); MASAYA: southwestern slopes of Santiago Volcano, near Masaya, alt. 300–480 m., July 5, 1923, *Maxon 7666* (US).

COSTA RICA: GUANACASTE: pentes rocheuses des collines de Nicoya, Jan., 1900, *Tonduz 13681* (B, BB, G, US); sur les rochers de la Baie de Salinas, July, 1890, *Pittier 2622* (BB, Bx, US); autour de maisons à Santo Domingo de Golfo Dulce, May, 1896, *Tonduz 9919* (Bx, US).

PANAMA: CHIRIQUÍ: vicinity of San Felix, alt. 0–120 m., Dec., 1911, *Pittier 5289* (US); COCLÉ: Penonomé and vicinity, alt. 50–1000 m., Febr. 23–March 22,

1908, *Williams 620* (NY); PANAMÁ: Taboga Island, Jan. 25, 1935, *Allen 133* (MBG); CANAL ZONE: Corozal, Jan. 16, 1922, *Greenman & Greenman 5212* (MBG).

I believe that the foregoing specimens approximate the natural distribution of *P. rubra*, augmented considerably, no doubt, by cultivation and escape. The specimens following, I believe to be the result of cultivation, and are of interest chiefly from the standpoint of dynamic floristics of cultivated ruderals. Beside the following records from America, there are also many herbarium records of the species from the Philippine Islands, Hawaii, Formosa, Indo-China, India, and Africa, which are obviously without the general scope of this paper.

UNITED STATES: FLORIDA: Miami, cultivated, Aug. 27, 1929, *Irving s.n.* (US). BERMUDA: Somerset Island, planted, Aug. 27–Sept. 21, 1912, *Brown & Britton 1009* (NY).

BAHAMA ISLANDS: ANDROS: Mastic Pt., June, 1890, *Northrop & Northrop 601* (B, NY); Mangrove Cay, 1904, *Bryant 6* (G).

CUBA: CAMAGUEY: Camaguey, gardens, April 2–7, 1912, *Britton Britton & Cowell 13218* (NY, US); HAVANA: Santiago de la Vega, 1904, *Hermann 234* (FM, NY); ORIENTE: prope villam Monte Verde, Jan.–July, 1859, *Wright s.n.* (G); SANTA CLARA: Soledad, Cienfuegos, Aug. 20, 1927, *Jack 5320* (NY).

HISPANIOLA: HAITI: vicinity of St. Louis du Nord, cemetery, April 7, 1929, *Leonard & Leonard 14597* (US); Massif de la Selle, Port-au-Prince, Montfleury, Aug. 11, 1926, *Ekman 6618* (B, S, US); vicinity of Cap Haitien, July 23, 1920, *Leonard 5314* (NY, US);

JAMAICA: Stony Hill, Mount Pleasant, growing in open situations, July 21, 1912, *Harris 11126* (G, NY, US); data incomplete, *Alexander s.n.* (NY).

PUERTO RICO: near Ponce, July 8, 1901, *Underwood & Griggs 695* (NY, US); Bayamon, May 19, 1916, *Stevenson 5357* (US).

VIRGIN ISLANDS: ST. CROIX: Bassin, April 7, 1896, *Ricksecker 360* (G, MBG, NY).

GUADELOUPE: Basse-Terre, introduit et cultivé, 1899, *Duss 2839* (B, NY).

BRITISH WEST INDIES: ST. VINCENT: leeward side, second growth, naturalized sparingly, alt. 100 ft., Oct., 1890, *Smith & Smith 550* (B, NY); ST. KITTS: Molyneaux estate, planted along road, Sept. 8–Oct. 5, 1901, *Britton & Cowell 278* (NY); GRENADA: The Bower, St. George's, April 11, 1905, *Broadway 1799* (G, NY); UNION: leeward side at Chatham Bay, March 26, 1933, *Cooper 207* (NY); TOBAGO: Botanic Garden Station, cultivated, April 12, 1913, *Broadway 2994* (G, MBG, MP, S, US).

COLOMBIA: CAUCA: La Paila, May, 1853, *Holton s.n.* (BB, D, G).

VENEZUELA: ARAGUA: La Victoria, alt. 2000 ft., Dec. 15, 1856, *Fendler 2108* (G); Mission Station Maracay (St. Ottlien), Oct., 1925, *Zehntner s.n.* (M); BOLIVAR (?): in insula Panuramae (Orinoco), date lacking, *Bonpland 1138* (B).

BRAZIL: CEARA: planted in yards, Maranguape, Nov. 6, 1935, *Drouet 2678* (G); MATTO GROSSO: Cuyaba, Febr. 12, 1894, *Malme 1398* (S); data incomplete, *Wed-*

dell 3423 (M); MINAS GERAES: Serrados Vertentes, Aug. 22, 1882, *Glaziou 14070* (MP); PARA: Para, May, 1820, *Martius 267* (M); data incomplete, *Burchell 10069* (G, MP); PERNAMBUCO: Tapera, cultivated, Febr. 9, 1934, *Pickel 3504* (US).

ECUADOR: CHIMBORAZO: vicinity of Huigra, mostly on the Hacienda de Licay, cultivated, said to come from the coast, Sept. 5, 1918, *Rose & Rose 22528* (US); EL ORO: vicinity of Santa Rosa, Oct. 17–18, 1918, *Rose & Rose 23486* (US); GUAYAS: westlich Guayaquil, Buschwald, alt. 20 m., Nov. 7, 1933, *Schimpff 407* (MBG); base of Cerro Santa Ana, alt. 10 m., cultivated, Dec. 6, 1934, *Mexia 6747* (MBG).

PERU: LORETO: forest, Mishuyacu, near Iquitos, alt. 100 m., Oct.–Nov., 1929, *Klug 100* (US); dense forest, Rio Maranon valley, alt. 150 m., Aug. 20–Sept. 8, 1929, *Killip Smith & Dennis 29226* (US); dense forest, Yurimaguas, lower Rio Huallaga, alt. 135 m., Aug. 23–Sept. 7, 1929, *Killip & Smith 27710* (US).

The variability of the corolla color of *P. rubra* already has been discussed. For the benefit of those who wish distinction in this matter, it probably is permissible to recognize the following color forms, which represent only the more prevalent variations:

P. RUBRA L. forma **typica**: corolla predominantly rose of varying intensity; usually with a "yellow eye."

P. RUBRA L. forma **lutea** (R. & P.) Woodson, comb. nov.: corolla predominantly yellow, occasionally flushed with rose without.

P. RUBRA L. forma **acutifolia** (Ait.) Woodson, comb. nov.: corolla white, usually with a "yellow eye;" occasionally flushed with rose without.

P. RUBRA L. forma **tricolor** (R. & P.) Woodson, comb. nov.: corolla predominantly white, but the outer margin of the lobes rose; usually with a "yellow eye."

Since the flower color usually is almost completely lost in desiccation, it is not possible to cite specimens consistently for each of these formae. *P. rubra* is the only species of either *Plumeria* or *Himatanthus* with flowers other than white "with a yellow eye"; hence it is easy to assign names which are not represented by existing specimens when the flower color has been noted as other than white, as in the case of *P. loranthifolia* Muell.-Arg., represented now by two very fragmentary specimens from southern and eastern Brazil, but described by the author as probably bearing red flowers. The type of *P. loranthifolia* almost unquestionably is an escape from cultivation

referable with confidence to *P. rubra*. It is further of interest to note that the several species of *Plumeria* described from Peru by Ruiz & Pavon are noted by the authors as occurring "in hortis"; doubtless importations from Mexico or Central America of the *P. rubra* complex.

4. PLUMERIA OBTUSA L. Sp. Pl. ed. 1. **1**: 210. 1753; A. DC. in DC. Prodr. **8**: 392. 1844; Britton, Bull. Torrey Bot. Club. **42**: 505. 1915.

var. **typica.**

Plumeria Tenorii Gasp. Oss. Piant. Ort. Boccad. p. 20. 1833; A. DC. in DC. Prodr. **8**: 391. 1844.

Plumieria obtusa L. β. *parviflora* Griseb. Mem. Amer. Acad. II. **8**: 519. 1862.

Plumieria obtusa L. γ. *laevis* Griseb. Mem. Amer. Acad. II. **8**: 519. 1862.

Plumeria clusioides Griseb. Cat. Pl. Cub. 171. 1866; Britton, Bull. Torrey Bot. Club **42**: 504. 1915.

Plumieria emarginata Griseb. Cat. Pl. Cub. 171. 1866; Britton, Bull. Torrey Bot. Club **42**: 505. 1915.

Plumieria clusioides Griseb. var. *parviflora* Maza, Ann. Soc. Esp. Hist. Nat. **23**: 273. 1895.

Plumieria Krugii Urb. Symb. Ant. **1**: 387. 1900.

Plumieria bahamensis Urb. Symb. Ant. **1**: 387. 1900.

Plumieria portoricensis Urb. Symb. Ant. **1**: 387. 1900.

Plumieria Marchii Urb. Symb. Ant. **3**: 334. 1902.

Plumiera inaguensis Britton, Bull. N. Y. Bot. Gard. **3**: 448. 1905.

Plumiera jamaicensis Britton, Bull. Torrey Bot. Club **37**: 356. 1910.

Plumiera confusa Britton, Bull. Torrey Bot. Club **42**: 505. 1915.

Plumiera nipensis Britton, Bull. Torrey Bot. Club **42**: 505. 1915.

Plumieria venosa Britton, Bull. Torrey Bot. Club **42**: 506. 1915.

Plumeria barahonensis Urb. in Fedde, Repert. Spec. Nov. **14**: 341. 1916.

Plumeria apiculata Urb. in Fedde, Repert. Spec. Nov. **16**: 36. 1919.

Plumiera montana Britton & Wils. Bull. Torrey Bot. Club **50**: 46. 1923.

Plumeria Ostenfeldii Urb. Dansk Bot. Arkiv **4**[7]: 8. *pl. 2.* 1924.

Plumeria beatensis Urb. Dansk Bot. Arkiv **4**[7]: 9. 1924.

Plumeria dictyophylla Urb. Symb. Ant. **9**: 239. 1924.

Plumeria estrellensis Urb. Symb. Ant. **9**: 240. 1924.

Plumeria Ekmanii Urb. Symb. Ant. **9**: 239. 1924.

Plumeria cubensis Urb. in Fedde, Repert. Spec. Nov. **21**: 219. 1925.

Plumeria cayensis Urb. in Fedde, Repert. Spec. Nov. **21**: 218. 1925.

Plumeria cuneifolia Helwig, Arkiv f. Bot. **22A**[10]: 44. 1929.

Plants wholly glabrous throughout.

BAHAMA ISLANDS: ABACO: coppice, Eight-Mile Bay, Dec. 27, 1904, *Brace 1891* (NY); ACKLIN'S: Spring Point, Dec. 21–Jan. 6, 1906, *Brace 4275* (NY); ANDROS: Fresh Creek, June 11, 1890, *Northrop & Northrop 651* (B, BB, G, NY); CAT: Nov. 20, 1890, *Hitchcock s.n.* (MBG); CROOKED: Gun Bluff, Jan. 9–23, 1906, *Brace 4701* (NY); ELEUTHERA: Rock Sound and vicinity, Febr. 21–22, 1907, *Britton & Millspaugh 5565* (NY); GRAND TURK: scrub, Aug. 27–Sept. 1, 1905, *Nash & Taylor 3799* (US); GREAT BAHAMA: coppice, Pinder's Point, Febr. 5–13, 1905, *Britton & Millspaugh 2522* (NY); GUN CAY: April 15, 1904, *Millspaugh 2316* (FM, NY); INAGUA: Dec. 4, 1890, *Hitchcock s.n.* (MBG); LONG CAY: Hanna Hill, Dec. 7–17, 1905, *Brace 4013* (NY, US); NEW PROVIDENCE: coastal thickets near caves, Aug. 26, 1904, *Britton & Brace 299* (G, NY, US); HOG: June 7, 1909, *Wilson 8424* (NY); PROVIDENCIALES: Dec. 19, 1907, *Wilson 7750* (NY); RUM CAY: Jan. 6, 1932, *Fairchild 2570* (MBG, US); SHIP CHANNEL CAY: on rocks, Febr. 17, 1905, *Britton & Millspaugh 2757* (NY); SOUTH CAICOS: East Harbor and vicinity, March 6–7, 1911, *Millspaugh & Millspaugh 9233* (NY); WATLING'S: Cockburn Town and vicinity, March 12–13, 1907, *Britton & Millspaugh 6074* (NY); WEST CAICOS: Dec. 20, 1907, *Wilson 7757* (NY).

CUBA: CAMAGUEY: vicinity of Pueblo, Cayo Romano, Oct. 8–9, 1909, *Shafer 2470* (NY, US); on limestone tuffs, Pastelillo, June 24, 1924, *Ekman 19070* (S); Cayo Sabinal, ad marginem sylvae, Oct. 17, 1922, *Ekman 15529* (B, S); HAVANA: Yata Hills, Guanabacoa, July 19, 1917, *Leon 7337* (NY); ad Rio Quezada in cuabales, May 27, 1923, *Ekman 16448* (B, S); MATANZAS: near Nueva Gerona, Isla de Pinos, June 4, 1904, *Curtiss 524* (B, D, G, M, MBG, US); prope Cardenas, in rupibus calcareis ad Varadero, July 13, 1923, *Ekman 17138* (B, S); PINAR DEL RIO: in Sierra Organos, May 8, 1922, *Ekman 13769* (B, S); limestone hills, vicinity of Sumidero, July 28–31, 1912, *Shafer 13442* (US); SANTA CLARA: Montes de Bartolina, Aug. 1, 1930, *Leon 14641* (NY); common on rocks near Cienequita, May 15, 1895, *Combs 36* (G, MBG, MP, NY); prope urbem Santa Clara in palme-

citis, June 13, 1922, *Ekman 14044* (B, S); ORIENTE: Guana River basin, Aug. 30, 1906, *Taylor 93* (NY); prope Guatanamo, in rupibus calcareis, Oct. 24, 1914, *Ekman 2910* (B, S); prope villam Monte Verde, Jan.–July, 1859, *Wright 1381* (B, BB, Bx, D, G, MBG, MP).

JAMAICA: Plato Road, alt. 3000 ft., June 19, 1899, *Harris 7791* (B); Constant Spring, alt. 600 ft., Aug. 12, 1895, *Campbell 5973* (B); coral rocks on seashore, near Port Antonio, June 23, 1897, *Fredholm 3058* (US); Great Goat Id., Old Harbor Bay, March 4, 1908, *Harris 10168* (B, US); South Shores, Cayman Brac, Febr. 10, 1899, *Millspaugh 1229* (B).

HISPANIOLA: HAITI: limestone terraces west of Saline-Michel, Presqu'ile du Nord-Ouest, Port-de-Paix, Aug. 5, 1925, *Ekmann 4577* (B, S, US); Massif du Nord, Bassin-Zinne, alt. 300 m., May 9, 1926, *Ekman 6053* (S, US); Petite Gonave Is., July 9–10, 1920, *Leonard 5255* (B, US); vicinity of Basse-Terre, Tortue Is., March 27, 1929, *Leonard & Leonard 12505* (US); Massif des Cahos, Pet. Riv. de l'Artibonite, road to Mèdor, March 4, 1925, *Ekman 3381* (S); Massif de la Hotte, Morne Rochelois, Miragoane, limestone hills south of town, July 23, 1926, *Ekman 6483* (B, S); DOMINICAN REPUBLIC: Cordillera Central, Prov. de Samana, June 29, 1930, *Ekman 15486* (US); Beata Is., Febr. 23, 1922, *Ostenfeld 341* (B, NY); Distr. de Moncion, Prov. Monte Cristi, Sept. 5, prope Barahona, alt. 70 m., Aug., 1911, *Fuertes 941* (B, G, US).

PUERTO RICO: prope Maricao, in declivibus montis "Alegrijo," Nov. 26, 1884, *Sintenis 321* (B, G, US); serpentine hillside, Santa Ana, near Sabana Grande, Febr. 9, 1915, *Britton & Cowell 4034* (US); Moca, June 29, 1914, *Johnston 2055* (US); Mona Is., Dec. 20–21, 1913, *Stevens 6184* (NY).

HONDURAS: Coral Rock, Larger Is., Swan Islands, April 2, 1912, *Nelson 77* (G).

var. **sericifolia** (Wright) Woodson, comb. nov.

Plumeria tuberculata Lodd. Bot. Cab. *pl. 681.* 1822; A. DC. in DC. Prodr. **8**: 393. 1844.

Plumieria sericifolia Wright, ex Griseb. Cat. Pl. Cub. 171. 1866; Britton, Bull. Torrey Bot. Club **42**: 504. 1915.

Plumieria emarginata Griseb. β. *sericifolia* (Wright) Gomez, Anal. Soc. Esp. Hist. Nat. **23**: 273. 1894.

Plumieria gibbosa Urb. Symb. Ant. **3**: 338. 1902.

Plumieria domingensis Urb. Symb. Ant. **3**: 338. 1902.

Plumiera lanata Britton, Bull. Torrey Bot. Club **42**: 504. 1915.

Plumiera trinitensis Britton, Bull. Torrey Bot. Club **42**: 506. 1915.

Plumeria casildensis Urb. in Fedde, Repert. Spec. Nov. **21**: 218. 1924.

Plumeria pilosula Urb. Symb. Ant. **9**: 238. 1924.

Plumeria leuconeura Urb. in Fedde, Repert. Spec. Nov. **24**: 8. 1927.

Plumeria multiflora Standl. Field Mus. Publ. Bot. **8**: 33. 1930.

Lower surface of leaves, and frequently petioles and inflorescence, more or less conspicuously pubescent; in all other essential details similar to the typical variety.

UNITED STATES: FLORIDA: Key West, date lacking, *Blodgett s.n.* (US); Miami, cultivated, Aug. 22, 1929, *Irving s.n.* (US).

BAHAMA ISLANDS: INAGUA: Dec. 4, 1890, *Hitchcock s.n.* (FM, MBG, NY).

CUBA: HAVANA: Cojimar, June 6, 1895, *Baker 5129* (B, NY); top of Loma de la Pita, San Miguel, May 20, 1920, *Leon Ekman & Roig 9117* (NY); MATANZAS: mouth of the Bueyvaca, Aug. 28, 1903, *Britton & Wilson 61* (NY); in Pan de Matanzas, solo calcares in sylvis, May 30, 1923, *Ekman 16461* (B, S); ORIENTE: Sabana to Maisi, Dec. 13, 1910, *Shafer 7908* (NY); prope Guantanamo, in rupibus calcareis, Sept. 24, 1914, *Ekman 2909* (B, S); data incomplete, *Wright 2952* (BB, D, G, MBG, NY, US); PINAR DEL RIO: coastal thicket, Bay Mariel, Sept. 21, 1910, *Britton & Earle 7590* (NY); SANTA CLARA: dry hillside, La Vigia Hill, Trinidad, March 14, 1910, *Britton & Wilson 5514* (NY); prope Casilda, in fruticetis litoralibus, March 28, 1924, *Ekman 18877* (B, S).

HISPANIOLA: HAITI: Massif de la Hotte, limestone hills, July 23, 1926, *Ekman 6483* (US); Massif de la Selle, limestone cliffs, July 20, 1926, *Ekman 6681* (S, US); Presqu'ile du Nord-Ouest, Port-de-Paix, May 3, 1925, *Ekman 3995* (S, US); prope Cap Haitien, Dept. du Nord, in the steep limestone rocks of Morne La Vigie, alt. 300 m., Dec. 1, 1924, *Ekman 2716* (B, S); DOMINICAN REPUBLIC: Azua, hill north of town, March 3, 1913, *Rose Fitch & Russell 3862* (NY); rocky scrub, La Romana, Dec. 1–3, 1909, *Taylor 378* (NY); Magua, alt. 300–400 m., April 8, 1933, *Valeur 969* (MBG, NY); in thickets toward El Fronton, Cabo Samana, June 18, 1930, *Ekman 15340* (S); prope Susua, circa Puerto Grande, in rupibus calcareis ad maris litus, June 22, 1887, *Eggers 2593* (B).

MEXICO: YUCATAN: in forest, Chichen Itza, June 15, 1932, *Steere 1320* (MBG); southeast, Kancabconot, May, 1917, *Gaumer 23880* (FM, MBG, NY, US).

BRITISH HONDURAS: Honey Camp, Sept., 1928, *Lundell X* (US).

5. PLUMERIA FILIFOLIA Griseb. Mem. Amer. Acad. II. **8**: 519. 1862; Britton, Bull. Torrey Bot. Club **42**: 504. 1915.

Plumeria stenophylla Urb. Symb. Ant. **9**: 237. 1924.

CUBA: ORIENTE: river cliffs, Ensenada de Mora, March 26–29, 1912, *Britton Cowell & Shafer 12951* (US); Daiquiri, in collibus calcareis ad Papaya, Nov. 18, 1916, *Ekman 8393* (B, S); prope Palmarito de Cauto, in collibus calcareis "Mogote," alt. 300 m., April 10, 1918, *Ekman 9175* (B, S); Bayate, Picote im cacum, montis c. 550 m., July 16, 1916, *Ekman 7409* (S); Maria Pilar, ad Rio Baconas in collibus siccis (solo eruptivo), Nov. 5, 1916, *Ekman 8236* (S); in rupibus calcar. ad Rio Jimbambay, Sierra de Nipe, April 27, 1919, *Ekman 9569* (B); top of mountain, Palmarito de Canto, June 27, 1924, *Ekman 19087* (S); data incomplete, 1860, *Wright 1660* (B, BB, Bx, D, G, MBG, ISOTYPES).

6. PLUMERIA ALBA L. Sp. Pl. ed. 1. 1: 210. 1753; A. DC. in DC. Prodr. 8: 392. 1844; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 136. 1895.

Plumeria hypoleuca Gasp. Oss. Piant. Ort. Boccad. p. 20. 1833; A. DC. in DC. Prodr. 8: 392. 1844.

Plumeria hypoleuca Gasp. β. *angustifolia* Gasp. Oss. Piant. Ort. Boccad. p. 20. 1833.

Plumeria alba L. β. *Jacquiniana* A. DC. in DC. Prodr. 8: 392. 1844.

PUERTO RICO: coastal thickets, Dorado, Febr. 13, 1914, *Britton & Cowell 1499* (NY, US); Manati, June 13, 1914, *Stevenson 548* (US); Fajardo, in fruticetis, May 20, 1885, *Sintenis 1633* (G, US); very dry hillside with cactus, Agaves, etc., Coama Springs, July 1, 1901, *Underwood & Griggs 543* (US); Arecibo, May 21, 1913, *Stevens 1776* (NY); thicket, Vieques Is., Febr. 7, 1914, *Shafer 2766* (MBG, NY, US); prope Bayamon in petrosis maritimis, June, 1886, *Stahl 546* (B).

VIRGIN ISLANDS: ST. CROIX: Salt River, May 15, 1896, *Ricksecker 395* (G, MBG, NY, US); ST. JOHN: mountain slopes, rocky soil, June 22, 1921, *Morrow 147* (US); ST. THOMAS: hillside thicket, Cowell Point, Jan. 31–Febr. 4, 1913, *Britton Britton & Shafer 86* (NY, US); hillside, Buck Is., Febr. 7, 1913, *Britton & Shafer 377* (NY, US).

BRITISH WEST INDIES: ANAGADA: rocky plain near settlement, Febr. 19–20, 1913, *Britton & Fishlock 1059* (NY); ANTIGUA: near Cades Bay, Febr. 10, 1913, *Rose Fitch & Russell 3405* (NY, US); BECQUIA: data incomplete, *Smith & Smith B99* (G); GRENADA: Quarentine Station, St. George's, May 22, 1906, *Broadway s.n.* (NY); MONTSERRAT: dry hillside, Bransby Point, Jan. 21, 1907, *Shafer 108* (NY, US); TORTOLA: rocky hillside, road to Sea Cove Bay, Febr. 13–17, 1913, *Britton & Shafer 682* (NY, US); VIRGIN GORDA: coastal hills, Little Dix Bay, Nov. 13, 1918, *Fishlock 79* (NY).

FRENCH WEST INDIES: GUADELOUPE: endroits secs et rocailleux, 1903, *Duss 2838* (B, NY, US); MARTINIQUE: endroits rocailleux, Ste. Anne, 1883, *Duss 1863* (B, NY, US).

DUTCH WEST INDIES: ST. MARTIN: hedges, Sept. 6, 1901, *Britton & Cowell 80* (NY); SABA: 1906, *Boldingh 1354* (B, NY).

This certainly is the most constant species of *Plumeria*. The peculiar form of "puckered" revolution of the desiccated leaves is one of the most characteristic features of *P. alba*, and is well shown in the old plates in Miller's 'Dictionary.'

7. PLUMERIA SUBSESSILIS A. DC. in DC. Prodr. 8: 393. 1844.
Plumeria Berterii A. DC. in DC. 8: 393. 1844.
Plumeria Jaegeri Muell.-Arg. Linnaea 30: 397. 1860.

HISPANIOLA: HAITI: Morne Dumais, in declivibus siccis, alt. 1000 m., Aug., 1916, *Buch 1341* (B, US); Massif de la Selle, between Fort-Jacques and Cadets, alt.

1100–1200 m., Sept. 7, 1924, *Ekman 1806* (S, US); Massif des Matheux, Thomazeau, Morne-à-Cabrits, alt. 350 m., May 17, 1928, *Ekman 9977* (B, US); Port-au-Prince to Petionville, alt. 500 ft., hillside, Sept. 6, 1903, *Nash 964* (NY); arid foothill, vicinity of Fond Parisien, Étang Saumatre, May 5–13, 1920, *Leonard 4150* (NY, US); arid foothills, vicinity of Petionville, alt. 350 m., June 15–28, 1920, *Leonard 4344* (NY, US); banks along road from Petionville to Port-au-Prince, May 19–23, 1929, *Leonard & Leonard 15822* (NY, US); Monte Cabrete, Aug. 26, 1917, *Cook Scofield & Doyle 73* (US); in alpibus montis La Coupe, June 30, 1928, *Jaeger 194* (B, G, NY, S, US); DOMINICAN REPUBLIC: vicinity of Constanza, April 10–May 15, 1919, *Abbott s.n.* (US); Barahona, alt. 300 m., March, 1911, *Fuertes 883* (B, D, US); prope Mamil de Ocoa, alt. 300 m., in declivibus apricis, Oct., 1910, *Tuerckheim 3754* (M, NY); Arroya de Voca, March 20, 1922, *von Schrenk 39* (MBG); Azua, Bohios del Canal, steep hillside, c. 750 m., March 26, 1929, *Ekman 12057* (B, S).

The peculiar form and venation of the foliage render this perhaps the most distinctive species of *Plumeria*. Its possible hybridization with other species is treated in the following paragraphs.

EVIDENCES OF HYBRIDIZATION IN THE GENUS PLUMERIA

As one examines a representative suite of herbarium specimens of *Plumeria* from Hispaniola, one is struck by the great variability of the plants from the Republic of Haiti. This variation is not more or less quantitative, as that of *P. obtusa* in Cuba, for example, but is rather conspicuously qualitative as well. The great diversification of Plumerias in Haiti has prompted several specific segregates by Urban and Ekman. Far from producing the desired result of more concise identification, however, the recent "splitting" of species has led only to confusion in correlating an increasing diversification of leaf forms with the published descriptions.

In an attempt to solve the problem of variation of the Haitian Plumerias, one is confronted at the outset, as has been implied, with the fact that Hispaniola is the only land mass where such a condition occurs. Secondly, one remembers *P. subsessilis*, which is endemic to Hispaniola, and its peculiar, subsessile leaves with exceedingly prominent venation with secondary veins abruptly entering the midrib at a conspicuously decurrent angle. The occurrence of modifications of the peculiar venation of *P. subsessilis* is found to a greater or lesser extent

in specimens of the recently segregated "species," together with a marked tendency toward the continuously arcuate or subhorizontal venation of other species of *Plumeria;* and almost at once suggests the explanation of the coincident variability of the genus in Hispaniola and the endemism of *P. subsessilis* upon the basis of interfertility of that species with other neighboring congeners.

Beside *P. subsessilis,* both *P. obtusa* L. (two varieties) and *P. rubra* L. occur in Haiti, the former probably indigenous, the latter doubtless introduced. The characteristics of these three putative parents of the supposed hybrids may be summarized as follows:

P. subsessilis A. DC. Leaves oblong to oblong-obovate, obtuse to very abruptly acuminate, subsessile, 8–24 cm. long, 2.5–5.5 cm. broad, rather delicately membranaceous, the secondary veins departing from the leaf margin subhorizontally or in a broad arc, abruptly entering the midrib at an acute, conspicuously decurrent angle; aestivation of corolla-lobes somewhat spiral; flowers white "with a yellow eye"; plants wholly glabrous.

P. rubra L. Leaves broadly elliptic, obovate to oblong-oblanceolate, obtuse to acuminate, long-petiolate, 12–50 cm. long, 3.5–15.0 cm. broad, firmly membranaceous, opaque, wholly glabrous to densely pubescent beneath, the secondary venation broadly arcuate to essentially rectilinear, sometimes entering the midrib in an inconspicuously decurrent fashion; inflorescence glabrous to more or less pubescent; corolla white "with a yellow eye" to various shades of rose and yellow, occasionally particolored, aestivation of the lobes strikingly spiral.

P. obtusa L. Leaves obovate to obovate-oblong, obtuse or rounded to very shortly acuminate, 3.5–18.0 cm. long, 1.0–8.5 cm. broad, manifestly petiolate, coriaceous to subcoriaceous, more or less lustrous above, wholly glabrous to densely pubescent beneath, secondary venation continuously oblique or subhorizontal, essentially rectilinear, directly entering the midrib; inflorescence glabrous; corolla white "with a yellow eye," aestivation of the lobes nearly longitudinal or only slightly spiral.

As one examines the supposed hybrids, it is found possible to sort them roughly into two groups as follows:

Group 1: Very closely resembling *P. subsessilis,* but leaves with less characteristic venation, and with petioles 0.5–2.5 cm. long; inflorescence tending to be pubescent in some cases, and leaves more nearly elliptic, but still rather delicately membranaceous and not at all coriaceous, occasionally somewhat pubescent:

HAITI: Massif des Matheux, July 15, 1924, *Ekman 904* (US); Massif des Matheux, Thomazeau, May 17, 1928, *Ekman 9975* (US); same locality, July 3, 1927, *Ekman 8563* (B); Morne à Cabrits, July 14, 1924, *Ekman 889* (B, TYPE of *P. longiflora* Urb. & Ekm.); Morne à Cabrits, July 3, 1927, *Eyerdam 3* (G,

US); in territorio Plaine, July, 1900, *Buch 348* (B, TYPE of *P. Paulinae*, NY, ISOTYPE); in Plaine ad M. Mori, July, 1897, *Picarda 1608* (B, TYPE of *P. stenopetala* Urb.); Gonaives, plain, alt. 400 ft., Aug. 16, 1905, *Nash & Taylor 1774* (NY); Massif des Matheux, Croix-des-Bouquets, July 18, 1924, *Ekman 972* (US); Coupe de Pintad, Aug. 21, 1924, *Cook 11* (NY, US).

Group 2: Leaves broadly elliptic to obovate-elliptic, broadly acuminate, 12–35 cm. long, 3–11 cm. broad, firmly membranaceous, opaque above, densely pubescent to glabrate beneath, secondary venation mostly broadly arcuate, frequently with a trace of the decurrent entry to the midrib characteristic of *P. subsessilis;* petioles 1–7 cm. long; inflorescence occasionally somewhat pubescent; flowers white "with a yellow eye," occasionally "yellow at base," or "bud purplish without," aestivation of the lobes somewhat spiral:

HAITI: Dog Mountain, vicinity of Bombardopolis, Febr. 21–26, 1929, *Leonard & Leonard 13531* (MBG, US); vicinity of Mole St. Nicholas, Mole Gorge, arid thickets, Febr. 16, 1929, *Leonard & Leonard 3315* (US); vicinity of Bassin Bleu, arid mountain several miles west of town, April 17, 1929, *Leonard & Leonard 14769* (US); trail to Moustique Mts., vicinity of Bassin Bleu, April 21, 1929, *Leonard & Leonard 14930* (US); Massif de la Hotte, Jeremie, between Sources-Chaudes and Source-Cahouane, July 4, 1928, *Ekman 10239* (US); Massif de la Selle, prope Nouvelle Tourraine, Aug. 7, 1924, *Ekman 1359* (B, TYPE of *P. discolor* Urb. & Ekm., US, ISOTYPE); Massif de la Selle, Rio de la Gorge, in rocks, Febr. 13, 1925, *Ekman 3224* (B); dry lands along Puilboreau Road, vicinity of Ennery, Jan. 17, 1926, *Leonard 8900* (G, NY, US); Massif des Matheux, May 8, 1927, *Ekman 8084* (US); Massif de la Hotte, prope Petit-Goave, Aug. 1, 1926, *Ekman 6565* (B); Port-au-Prince, in horto cult., Oct. 6, 1924, *Ekman 2053* (B); inter Massif de la Selle et La Hotte prope Trouin, in collibus calc. ad rivulum, 500 m., alt., Nov. 5, 1924, *Ekman 2378* (B, TYPE of *P. trouinensis* Urb. & Ekm.); Massif de la Hotte, Grand-Goave, road Carrefour-Fauche to Trouin, in limestone hills, April 16, 1926, *Ekman 5867* (B, US); vicinity of Cabaret, Baie des Moustiques, Jan. 15, 1929, *Leonard & Leonard 12033* (US); Massif de la Selle, between Bois d'Orme and Dessoziers, April 19, 1926, *Ekman 5880* (B); La Brand to Mt. Balance, xerophytic region, Aug. 15, 1905, *Nash & Taylor 1650* (NY); Mt. La Mine, vicinity of St. Michel de l'Atalaye, Nov. 19, 1925, *Leonard 7229* (NY, US); same locality [leaves intermediate between group 1 and group 2], Nov. 22, 1925, *Leonard 7351* (G, US).

A comparison of the diagnoses of the three possible parent species and the two groups of putative hybrids will show a certain connection of the latter for *P. subsessilis,* and a more pronounced affinity with *P. rubra* than with *P. obtusa,* evidenced in group 2 by the large leaves of outline so resembling that characteristic of *P. rubra* that even Urban called attention to it (Symb. Ant. 3: 337. 1902, sub *P. biglandulosa).* An additional indication of hybridity involving *P. rubra* may be the occasional description of the flower color by collectors as "yel-

low at the base," and "buds purplish without," as well as the occasional pubescence of the inflorescence.

On the other hand, were *P. obtusa* involved in hybridization with *P. subsessilis,* one would expect the leaves of the hybrids to be more nearly the size of the former's, both with respect to the lamina and the petiole, and to have a heavier texture, together with a tendency toward an obovate outline. *P. obtusa* might also be expected to impart to its progeny flower buds with more nearly longitudinal aestivation of the corolla-lobes, and without a tendency toward yellow or purplish coloration of the corolla. Upon the basis of the foregoing considerations, obviously fallible without experimental evidence most difficult at the moment to obtain, a fair degree of confidence may be placed in ascribing putative hybridity to the following segregate species:

PLUMERIA **rubra** L. × P. **subsessilis** A. DC. (?)

Plumieria biglandulosa Urb. Symb. Ant. **3**: 337. 1902.

Plumieria Paulinae Urb. Symb. Ant. **3**: 336. 1902.

Plumieria stenopetala Urb. Symb. Ant. **3**: 335. 1902.

Plumeria stenopetala Urb. var. *angustissima* Urb. Arkiv f. Bot. **17**[1]: 50. 1921.

Plumeria longiflora Urb. & Ekm. in Urb. Arkiv f. Bot. **20A**[5]: 38. 1926.

Plumeria discolor Urb. & Ekm. in Urb. Arkiv f. Bot. **20A**[5]: 36. 1926.

Plumeria trouinensis Urb. & Ekm. in Urb. Arkiv f. Bot. **20A**[5]: 37. 1926.

At this point, attention should be called to the fact that at least some of the putative hybrids of *P. rubra* × *P. subsessilis* are fertile, producing follicles containing perfectly formed seeds.

Hybrids found in nature very rarely range themselves in a position exactly intermediate between either parent; therefore it is not surprising to find that the putative hybrids of *P. rubra* × *P. subsessilis* may be divided roughly into two groups, favoring one or the other parent in gross habit. The herbarium doubtless has its difficulties for the detection of hybridization,

but the methods of systematists who may be interested in the origins of their exsiccatae frequently have been confirmed by experimental geneticists and cytologists (cf. Clausen, J. Cytological evidence for the hybrid origin of *Pentstemon neotericus* Keck. Hereditas **18**: 65–76. 1933; Anderson, E. An experimental study of hybridization in the genus *Apocynum*. Ann. Mo. Bot. Gard. **23**: 159–168. 1936).

At least two reasons present themselves for the absence of hybrids from the Dominican Republic in sharp contrast to the abundance from Haiti. Collections from the former, as a whole, are far fewer than from Haiti. Hybrids may very well exist undetected under such conditions. Another consideration of possible importance, however, is the fact that although Haiti is approximately one half the area of the Dominican Republic, the population is nearly three times greater. *P. subsessilis* is indigenous to both republics. *P. rubra*, on the other hand, is introduced, and the opportunities of hybridization might well be greater in a country of high population than in one more sparsely settled. Several botanists have noticed the abundance of plant hybrids in regions disturbed by the human population (cf. Wiegand, K. M. A taxonomist's experience with hybrids in the wild. Science n.s. **81**: 161–166. 1935; Anderson, E. Hybridization in American Tradescantias. Ann. Mo. Bot. Gard. **23**: 511–525. 1936).

EXCLUDED OR DUBIOUS SPECIES

(Literature of the western hemisphere only)

Plumeria ambigua Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 37. 1860 = HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938 *(Plumeria phagedaenica* Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831).

Plumeria angustifolia Aubl. Pl. Guyan. 259. 1775, nom. subnud. Perhaps equivalent to *P. rubra* L.

Plumeria articulata Vahl, Eclog. **2**: 20. 1798 = HIMATANTHUS ARTICULATA (Vahl) Woodson, Ann. Mo. Bot. Gard. **25**: 196. 1938.

Plumeria attenuata Benth. in Hook. Jour. Bot. **3**: 245. 1841 =

HIMATANTHUS ATTENUATA (Benth.) Woodson, Ann. Mo. Bot. Gard. **25**: 197. 1938.

Plumeria bracteata A. DC. in DC. Prodr. **8**: 394. 1844 = HIMATANTHUS BRACTEATA (A. DC.) Woodson, Ann. Mo. Bot. Gard. **25**: 200. 1938.

Plumeria cuspidata Glaziou, Bull. Soc. Bot. Fr. **52**: Mem. 3e. 451. 1905. nom. subnud. The specimen is in fruit only, and certainly is not apocynaceous.

Plumeria drastica Mart. in Spix & Mart. Reise Bras. **2**: 547. 1828 = HIMATANTHUS ARTICULATA (Vahl) Woodson, Ann. Mo. Bot. Gard. **25**: 196. 1938 *(Plumeria articulata* Vahl, Eclog. Amer. 2: 20. 1798).

Plumeria fallax Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860 = HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938 *(Plumeria phagedaenica* Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831) in part; HIMATANTHUS ARTICULATA (Vahl) Woodson, Ann. Mo. Bot. Gard. **25**: 196. 1938 *(Plumeria articulata* Vahl, Eclog. Amer. 2: 20. 1798) in part.

Plumeria floribunda Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860 = HIMATANTHUS SUCUUBA (Spruce) Woodson, Ann. Mo. Bot. Gard. **25**: 198. 1938 *(Plumeria Sucuuba* Spruce, ex Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860) in part; HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938 *(Plumeria phagedaenica* Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831) in part.

Plumeria Hilariana Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson var. PUBERULA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. **25**: 201. 1938 *(Plumeria puberula* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860).

Plumeria lancifolia Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 41. 1860 = HIMATANTHUS LANCIFOLIA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. **25**: 200. 1938.

Plumiera latifolia Pilger, in Engl. Bot. Jahrb. **30**: 183. 1901 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson var. PUBERULA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. **25**: 201. 1938 *(Plumeria puberula* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860).

Plumeria Martii Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 37. 1860 = HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938 *(Plumeria phagedaenica* Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831).

Plumeria microcalyx Standl. Field Mus. Publ. Bot. **4**: 254. 1929 = HIMATANTHUS ARTICULATA (Vahl) Woodson, Ann. Mo. Bot. Gard. **25**: 196. 1938 *(Plumeria articulata* Vahl, Eclog. Amer. 2: 20. 1798).

Plumeria obovata Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. **25**: 201. 1938.

Plumeria oligoneura Malme, Arkiv f. Bot. **21A**[6]: 6. 1927. See note, p. 201.

Plumeria phagedaenica Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831 = HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938.

Plumeria puberula Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 39. 1860 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson var. PUBERULA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. **25**: 201. 1938.

Plumeria revoluta Huber, Bull. Soc. Bot. Genève II. **6**: 200. 1915 = HIMATANTHUS BRACTEATA (A. DC.) Woodson, Ann. Mo. Bot. Gard. **25**: 200. 1938 *(Plumeria bracteata* A. DC. in DC. Prodr. **8**: 394. 1844).

Plumeria speciosa Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 36. 1860 = HIMATANTHUS PHAGEDAENICA (Mart.) Woodson, Ann. Mo. Bot. Gard. **25**: 199. 1938 *(Plumeria phagedaenica* Mart. in Spix & Mart. Reise Bras. **3**: 1128. 1831).

Plumeria Sucuuba Spruce, ex Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860 = HIMATANTHUS SUCUUBA (Spruce) Woodson, Ann. Mo. Bot. Gard. **25**: 198. 1938.

Plumeria tarapotensis K. Sch. ex Mgf. Notizblatt **11**: 339. 1932 = HIMATANTHUS SUCUUBA (Spruce) Woodson, Ann. Mo. Bot. Gard. **25**: 198. 1938 *(Plumeria Sucuuba* Spruce, ex Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 40. 1860).

Plumeria velutina Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 38. 1860 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson var. PU-

BERULA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 25: 201. 1938 (*Plumeria puberula* Muell.-Arg. in Mart. Fl. Bras. 6[1]: 39. 1860).

Plumeria Warmingii Muell.-Arg. Kjoeb. Vidensk. Meddel. p. 99. 1869 = HIMATANTHUS OBOVATA (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 25: 201. 1938 (*Plumeria obovata* Muell.-Arg. in Mart. Fl. Bras. 6[1]: 40. 1860).

A REVISION OF THE GENUS LOMATIUM

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The genus *Lomatium* was described by Rafinesque[1] with a single species, *L. villosum*, which must accordingly be taken as the type of the genus. *Lomatium villosum* was based on a plant collected by Bradbury on the upper Missouri, and characterized as having white flowers and being entirely villous. It so happens that there are only three species of this genus in the region where Bradbury collected, namely *L. foeniculaceum*, *L. daucifolium*, and *L. orientale*. *L. orientale* is the only species of the three having white flowers, but the plants never are entirely villous. Although Bradbury collected specimens of *L. orientale*, it seems highly improbable that Rafinesque would term the plants villous. It is more probable that in the dried specimens the flower color was misinterpreted, and that the plant from which he drew his description was the yellow-flowered, villous *L. foeniculaceum* (*Peucedanum villosum* of Nuttall), the common species in the region on the upper Missouri visited by Bradbury.

In 1820 Sprengel[2] proposed the name *Cogswellia* in place of *Lomatium* Raf. which he considered to be antedated by *Lomatia* R. Br. (Proteaceae). Recent workers have used both *Cogswellia* and *Lomatium* in dealing with numerous species erroneously considered by numerous writers[3] to be congeneric with the European *Peucedanum* L.

The name *Lomatium* was not used by American authors until 1900, when Coulter & Rose[4] adopted it in their monograph

[1] Raf. Journ. Phys. 89: 101. 1819.
[2] Spreng. in Linn. Syst. Veg. ed. Roem. & Schult. 6: XLVIII. 1820.
[3] cf. S. Wats. Proc. Am. Acad. 11: 141. 1876, footnote.
[4] Coult. & Rose, Contr. U. S. Nat. Herb. 7: 204. 1900.

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of the Umbelliferae. In 1908 Jones[5] adopted the generic name *Cogswellia*, considering *Lomatium* as a homonym of *Lomatia* R. Br. Coulter and Rose[6] accepted the latter viewpoint in a later publication.

The name *Lomatium* Raf. was reinstated in 1918 by Macbride,[7] who drew attention to the fact that *Lomatia* R. Br. (Proteaceae) and *Lomatium* Raf. (Umbelliferae) cannot properly be considered as homonyms, and that the retention of both is provided for in Article 57 of the International Rules of Botanical Nomenclature (Article 70, third edition) which reads in part: "When the difference between two names, especially two generic names, lies in the termination, these names are to be regarded as distinct even though differing by one letter only."

Since the monograph by Coulter and Rose,[8] there has been no complete revision of the species of this complex and interesting genus. Numerous new species have been described, and the genus has been treated variously by authors of local manuals. It is still considered by most workers as one of the most difficult, because least understood, of the North American genera of Umbelliferae. It is in fact the largest genus of the family occurring in the United States. In distribution it is limited to the western United States, adjacent Canada, and Mexico, extending as far north as central Saskatchewan and southward into northern Sonora and Lower California. Its eastern limits apparently are from western Minnesota to Missouri. The greatest number of species are found in the Pacific coast states from the Columbia River area in eastern Washington to central California. In this area the genus has reached its greatest diversity.

The writer has had the opportunity of making field studies throughout most of this area. Herbarium material has been studied in all the larger herbaria in the United States and in many private collections. Whenever necessary, photographs

[5] M. E. Jones, Contr. Western Bot. **12**: 30. 1908.
[6] Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 448. 1909.
[7] Macbr. Contr. Gray Herb. n.s. **53**: 15. 1918.
[8] Coult. & Rose, *loc. cit.* 1900.

of critical specimens have been obtained from European herbaria.

The study of this genus was suggested by Dr. J. M. Greenman of the Missouri Botanical Garden. The writer wishes to take this opportunity to thank him again for his valuable and experienced advice and assistance, and to thank the curators of the numerous herbaria in which collections have been studied and the many collectors who have contributed material. Without access to a large amount of material this study would have been impossible. Unfortunately there is space in this paper to cite but a small portion of the material examined, and for the widely distributed, well-known species only typical specimens are included.

Flower characters are relatively constant in the genus. Flower color varies from white to purple and yellow. The fruit is always dorsally compressed, with the lateral wings usually well developed. The dorsal ribs are obsolete to filiform, rarely subalate. The oil tubes vary from one to many in the intervals and are rarely obscure. The stylopodium is absent and the disc never inflated. The styles are filiform, deciduous, or persistent. The calyx teeth are usually inconspicuous, especially in the mature fruit.

The plants are mostly low-growing, acaulescent, or caulescent, from a globose tuberous or elongated subfusiform root. The stems may be solitary or many from the base, and are rarely branching above. The leaves, rarely entire in the young plant, are ternately to pinnately or quinately decompound; the leaflets are filiform, sometimes greatly elongated, to suborbicular in outline, with the margins usually entire but sometimes dentate. The plants are glabrous to entirely or partially villous-tomentose. The involucre may be present or absent and is usually inconspicuous. The involucel bracts are rarely absent and vary to conspicuous, ovate-oblong, or obovate bractlets. The umbel is always compound and usually spreading with long rays. The pedicels are rarely less than 2 mm. long.

In this paper the characters of peduncle, ray, and pedicel length refer to the fruiting condition when these parts have reached their maximum length.

Lomatium Raf. Journ. Phys. **89**: 101. 1819.

Cogswellia Spreng. in Linn. Syst. Veg. ed. Roem. & Schult. 6: XLVIII. 1820.
Euryptera Nutt. in Torr. & Gray, Fl. N. Am. 1: 629. 1840.
Leibergia Coult. & Rose, Contr. U. S. Nat. Herb. 3: 575. 1896.
Cynomarathrum Nutt. ex Coulter & Rose, Contr. U. S. Nat. Herb. 7: 244. 1900.
"*Cogswellia* Raf." acc. to Coult. & Nels. Man. Bot. Centr. Rocky Mts. 362. 1909, in err.
Peucedanum of American authors, not of Linn.

Usually low, herbaceous, acaulescent or short-caulescent, glabrous or pubescent perennials, from globose tubers to long, thickened, subfusiform roots. Leaves petiolate, thin to subcoriaceous, ternately, pinnately, or quinately decompound; ultimate leaf divisions few to many, suborbicular to elongated, filiform, crowded or remote; petioles broadened into sheaths at least toward the base. Inflorescence a compound umbel, usually spreading; peduncles equalling to exceeding the leaves; involucre mostly absent, never conspicuous; involucel bracts rarely absent, filiform to obovate, foliaceous to subscarious, distinct or connate; central umbellets and central flowers usually sterile, short-rayed, and short-pedicellate; flowers greenish-white, purple, or yellow; calyx teeth small; petals ovate to obovate with a narrowed, inflexed, acute to acuminate tip; stylopodium lacking. Fruit ovate to linear, flattened dorsally; lateral wings present; dorsal wings absent or filiform; wings thin; oil tubes small, one to many in the intervals, rarely obscure, two to several on the commissural side; carpophore divided to the base, usually persistent.

Type species: *Lomatium villosum* Raf. Jour. Phys. **89**: 101. 1819 (L. foeniculaceum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 222. 1900).

KEY TO THE SPECIES

A. Peduncles not enlarged at the apex.
B. Fruit more or less deeply emarginate at each end, the wings distinct on each side of the body; leaflets mostly broad in outline.
C. Leaf segments not pinnatifid, merely toothed or sometimes 3-lobed.
E. Leaves 1–2-ternate; wings thickened, much broader than the body, oil tubes solitary in the intervals; plants of southern California
.....1. *L. lucidum*

EE. Leaves ternate-pinnate; wings thin, about equalling to broader than the body; oil tubes 1–3 in the intervals.

I. Fruit broadly elliptical; plants mostly low, of Napa and Lake counties, California.....2. *L. repostum*

II. Fruit suborbicular; plants mostly taller, of southern Oregon and adjacent California.....3. *L. Howellii*

CC. Leaf segments pinnatifid, usually incised.

F. Leaf blades large, longer than the petioles; fruit 12–15 mm. long; plants of San Nicolas Island, California.....5. *L. insulare*

FF. Leaf blades smaller, mostly equalling or shorter than the petioles; fruit 7–10 mm. long; plants of the California mainland.

J. Leaf segments acerose-tipped; wings less than half the width of the body; plants of the eastern slopes of the Sierra Nevada Mts., Inyo Co., California.....6. *L. rigidum*

JJ. Leaf segments not acerose-tipped; wings broader than the body; plants of Monterey and San Luis Obispo counties, California.

O. Foliage green; fruiting rays 0.8–2.5 cm. long, pedicels 3–6 mm. long.....4. *L. parvifolium*

OO. Foliage pale; fruiting rays 3–6.5 cm. long, pedicels 7–17 mm. long.....4a. *L. parvifolium* var. *pallidum*

BB. Fruit not emarginate or scarcely so, the wings more or less joined above and below the body; leaflets mostly narrow.

D. Plants mostly low, from globose or somewhat elongated tubers; leaves mostly small.

G. Ovaries and fruit variously pubescent.

K. Flowers white or purple; involucel bracts absent or setaceous.....7. *L. Gormani*

KK. Flowers yellow; involucel bracts distinct, obovate or connate.

P. Tuber deep-seated, oblong; involucel bracts united nearly to the apex; fruit ovate, sessile or subsessile; oil tubes obscure.....14. *L. Watsoni*

PP. Tuber globose or occasionally elongated; involucel bracts distinct, obovate, scarious-margined; fruit oblong, pedicels about 2–4 mm. long; oil tubes prominent.....17. *L. Cous*

GG. Ovaries and fruit glabrous.

L. Involucel bracts absent or inconspicuous.

Q. Plants caulescent, alternately branched above; flowers yellow; fruiting pedicels 4–8 mm. long.....16. *L. ambiguum*

QQ. Plants acaulescent or short-caulescent, not branched above; flowers white; fruit subsessile.....8. *L. Piperi*

LL. Involucel bracts present, conspicuous.

R. Leaflets few; fruit linear, 1–1.5 mm. broad, constricted toward the apex, the wings almost obsolete.....9. *L. orogenioides*

RR. Leaflets several to many; fruit ovate to linear-oblong, 2–6 mm. broad, not constricted above, the wings obvious.

W. Involucel bracts linear to linear-lanceolate, sometimes more or less connate.

f. Leaflets filiform to linear, mostly elongated, up to 8 cm. long; flowers white or yellow.

u. Flowers yellow; oil tubes solitary in the intervals.....
.....15. *L. leptocarpum*
uu. Flowers white; oil tubes several in the intervals.
o. Involucel bracts distinct; fruiting pedicels lax, 6–17 mm. long.....10. *L. farinosum*
oo. Involucel bracts more or less connate; fruiting pedicels suberect, 2–5 mm. long.....11. *L. Geyeri*
ff. Leaflets short-linear, up to 5 mm. long; flowers white.
w. Umbels 2–5-rayed, fruiting rays 1–2 cm. long, pedicels 3–4 mm. long; fruit ovate, 5 mm. long..12. *L. Hendersoni*
ww. Umbels 12–17-rayed, fruiting rays 2.7–5.5 cm. long, pedicels 8–12 mm. long; fruit linear-oblong, 7–10 mm. long.....13. *L. Canbyi*
WW. Involucel bracts obovate, sometimes connate.
g. Plants acaulescent; oil tubes 2–4 in the intervals.....
.....18. *L. montanum*
gg. Plants caulescent; oil tubes solitary in the intervals.....
.....19. *L. circumdatum*
DD. Plants usually stouter, from more or less thickened, elongated taproots, sometimes with a very deep-seated tuber.
H. Leaves decompound, dissected into numerous small segments.
M. Ovaries and young (sometimes mature) fruit variously pubescent or roughened.
S. Involucel bracts oblanceolate to obovate.
X. Umbels 5–13-rayed; wings mostly broader than the body.
h. Mature fruit glabrous.....21. *L. utriculatum*
hh. Mature fruit papillate....21a. *L. utriculatum* var. *papillatum*
XX. Umbels 14–25-rayed; wings equalling the body.....
.....20. *L. vaginatum*
SS. Involucel bracts mostly linear, never obovate, sometimes reduced to a sheath.
Y. Young fruit more or less granulate-roughened; plants with one or more upper stem leaves.
i. Petioles with a conspicuous white scarious margin; plants of the northern Rocky Mts.....36. *L. Sandbergii*
ii. Petioles without a conspicuous white scarious margin; plants of Plumas Co., California.....25c. *L. Plummerae* var. *Helleri*
YY. Young fruit variously pubescent, not granulate-roughened; plants acaulescent or with stem leaves from near the base.
j. Involucel bracts with a conspicuous scarious margin, never tomentose nor villous.....24. *L. nevadense*
jj. Involucel bracts not conspicuously scarious-margined, more or less tomentose or villous.
x. Plants acaulescent, usually low, up to 3, rarely 5, dm. tall.
y. Plants more or less villous throughout; petioles shorter than the leaf blades.
p. Petioles 1–2.5 cm. long, usually sheathing throughout; flowers yellow, tinged with purple; plants of the Great Basin.....26. *L. MacDougalii*

pp. Petioles 3–8 cm. long, sheathing about to the middle; flowers yellow; plants of the Great Plains .....28. *L. foeniculaceum*

yy. Plants hoary-pubescent, never villous; petioles longer than the leaf blades; plants of the deserts of California and adjacent Nevada.....32. *L. mohavense*

xx. Plants short-caulescent, rarely acaulescent, mostly taller, up to 5 dm. tall.

(d). Petals glabrous; fruit narrowly oblong, sparingly pubescent with long hairs.....34. *L. macrocarpum*

(dd). Petals tomentose; fruit ovate-oblong to orbicular, densely pubescent.

(m). Pedicels mostly longer than the mature fruit; wings broader than the body, membranous, thinly pubescent to glabrate....31. *L. dasycarpum*

(mm). Pedicels mostly shorter than the mature fruit; wings narrower than to equalling the body, somewhat thickened, tomentose..33. *L. tomentosum*

MM. Ovaries and fruit glabrous.

T. Involucel bracts absent.

Z. Foliage and peduncles pubescent; umbels 2–7-rayed..... .....38. *L. Engelmannii*

ZZ. Foliage and peduncles glabrous, rarely scaberulent; umbels 5–16-rayed.

k. Flowers white; fruiting pedicels 6–10 mm. long; plants of Mariposa Co., California.....35. *L. Congdoni*

kk. Flowers creamy-white to yellow; fruiting pedicels less than 6 mm. long except in *39a.*

z. Leaf segments filiform, 3–8 mm. long; plants of the southern Sierra Nevada Mts., California..... .....37. *L. Torreyi*

zz. Leaf segments ovate, 1–2 mm. long; plants of the northern coast ranges and Cascades, British Columbia to Oregon.

q. Flowers creamy-white; pedicels 1–6 mm. long..... .....39. *L. angustatum*

qq. Flowers lemon-yellow; pedicels 8–16 mm. long..... .....39a. *L. angustatum* var. *flavum*

TT. Involucel bracts present.

a. Involucel bracts obovate, sometimes connate.

m. Plants usually with several stem leaves, pilose...22. *L. Vaseyi*

mm. Plants without or with one stem leaf, glabrous to pubescent.

a. Plants glabrous or slightly pubescent; flowers yellow.

r. Plants caespitose; leaflets crowded; plants of montane Montana to Oregon.....18. *L. montanum*

rr. Plants not caespitose; leaflets distinct; plants not montane, of the coast ranges, California.

(e). Wing margins smooth.....23. *L. caruifolium*

(ee). Wing margins denticulate.....
.....23a. *L. caruifolium* var. *denticulatum*

aa. Plants scaberulent to densely pubescent; flowers white.

s. Plants soft-puberulent; involucel bracts distinct; fruiting rays subequal; plants of the Great Plains and eastern foothills of the Rocky Mts.....30. *L. orientale*

ss. Plants pubescent; involucel bracts connate, sometimes reduced; fruiting rays unequal; plants of the Great Basin.

(f). Wings narrower than the body, dorsal ribs inconspicuous.....24a. *L. nevadense* var. *Parishii*

(ff). Wings broader than the body, dorsal ribs conspicuous.....24b. *L. nevadense* var. *pseudorientale*

aa. Involucel bracts filiform to linear-lanceolate, never obovate.

n. Involucel bracts more or less tomentose or villous.

b. Flowers white; involucel bracts distinct, equalling to greatly exceeding the flowers.

t. Wings narrower than to equalling the body.....
.....34. *L. macrocarpum*

tt. Wings broader than the body.....
.....34a. *L. macrocarpum* var. *ellipticum*

bb. Flowers yellow; involucel bracts connate to above the middle, equalling the flowers.....29. *L. daucifolium*

nn. Involucel bracts glabrous or minutely and sparingly roughened.

c. Plants more or less pubescent.

u. Flowers yellow; plants mostly low, less than 3 dm. tall; plants of the Great Basin.

(g). Involucel bracts distinct; fruiting pedicels 5–10 mm. long; wings about half the width of the body; oil tubes several in the intervals.....
.....27. *L. juniperinum*

(gg). Involucel bracts connate at the base; fruiting pedicels 4–6, rarely 10, mm. long; wings nearly as broad as the body; oil tubes solitary in the intervals.

(n). Fruit oblong to oblong-ovate, 9–13 mm. long
.....25a. *L. Plummerae* var. *Sonnei*

(nn). Fruit ovate, 8 mm. long.....
.....25b. *L. Plummerae* var. *Austinae*

uu. Flowers white; plants usually taller, up to 4.5 dm. tall.

(h). Plants soft-puberulent; rays subequal; plants of the Great Plains and eastern foothills of the Rocky Mts.....30. *L. orientale*

(hh). Plants pubescent; rays unequal; plants of the Great Basin.

(o). Wings narrower than the body, dorsal ribs inconspicuous.....24a. *L. nevadense* var. *Parishii*

(oo). Wings broader than the body, dorsal ribs conspicuous...24b. *L. nevadense* var. *pseudorientale*

cc. Plants glabrous or occasionally slightly scaberulent, never pubescent; flowers yellow or purple.

w. Plants acaulescent or with a pseudoscape.

(i). Leaflets filiform, mostly elongated, up to 4.5 cm. long; flowers purple; plants of Napa Co., California.....23c. *L. caruifolium* var. *purpureum*

(ii). Leaflets linear to ovate-oblong, rarely filiform, usually shorter, up to 11 mm. long; flowers yellow; plants of the Great Basin.

(p). Plants up to 6.1 dm. tall; leaves broadly obovate, the blades large, 10.5 cm. or longer; involucel bracts shorter than the flowers.....40. *L. Grayi*

(pp). Plants low, up to 3 dm. tall; leaves ovate to oblong, the blades smaller, less than 10.5 cm. long; involucel bracts equalling the flowers.

(r). Leaves minutely papillose above; wings one-half to equalling the body, oil tubes solitary in the intervals.....41. *L. serpentinum*

(rr). Leaves glabrous above; wings less than half the width of the body, oil tubes 3–6 in the intervals.....42. *L. Donnellii*

ww. Plants short-caulescent.

(j). Leaflets remote, mostly elongated, up to 45 mm. long; plants of the western foothills of the Sierra Nevada Mts., California.....23b. *L. caruifolium* var. *marginatum*

(jj). Leaflets crowded, shorter, up to 11 mm. long.

(q). Petioles entirely sheathing; fruit acute at the apex; plants of east-central California and adjacent Nevada.....25. *L. Plummerae*

(qq). Petioles partially sheathing; fruit rounded at the apex.

(s). Involucel bracts sparingly hispid; oil tubes 3 in the intervals; plants of southwestern Oregon.....43. *L. Nelsonianum*

(ss). Involucel bracts glabrous; oil tubes solitary in the intervals; plants of the Great Basin .....40. *L. Grayi*

HH. Leaves with mostly few divisions, ternately or pinnately divided, the leaflets mostly remote.

N. Plants acaulescent or short-caulescent; leaves 1–2-pinnate, rarely 3-pinnate.

U. Foliage variously pubescent.

b. Leaves entirely pubescent.

o. Ovaries and fruit pubescent.....45. *L. oreganum*

oo. Ovaries and fruit glabrous.
d. Leaves pinnate; plants less than 1 dm. tall..44. *L. minimum*
dd. Leaves mostly 2–3-pinnate; plants 1 dm. or more tall.
y. Pedicels 6–17 mm. long; wings equalling to broader than the body; plants of southwestern Colorado....47. *L. Eastwoodae*
yy. Pedicels (2?)–9 mm. long; wings less than half the width of the body; plants of southwestern Utah....48. *L. scabrum*
bb. Leaves glabrous except for ciliolate margins....49. *L. ciliolatum*
UU. Foliage glabrous.
c. Leaves 2–3-pinnate.
p. Plants short-caulescent, 1.2–2.5 dm. tall; involucel bracts foliaceous, ovate-lanceolate; fruit ovate, 5–8 mm. long....50. *L. concinnum*
pp. Plants acaulescent, 1.5–5 dm. tall; involucel bracts linear; fruit oblong, 7–13 mm. long.
e. Peduncles equalling to somewhat exceeding the leaves; pedicels 10–17 mm. long; wings equalling or somewhat broader than the body....51. *L. Parryi*
ee. Peduncles usually greatly exceeding the leaves; pedicels 3–7 mm. long; wings about half the width of the body.
z. Leaflets remote, 10–50 mm. long; plants tall, stout....52. *L. Nuttallii*
zz. Leaflets crowded, 1–4 mm. long; plants lower, slender.
(k). Leaves bipinnate, pinnae few, remote....40a. *L. Grayi* var. *depauperatum*
(kk). Leaves tripinnate, pinnae many, crowded....53. *L. Hallii*
cc. Leaves pinnate, rarely bipinnate.
q. Plants less than 1 dm. tall; leaf blades less than 2.5 cm. long.
f. Plants acaulescent, 1–3.5 cm. tall; rays 3–12 mm. long; plants of southwestern Utah....44. *L. minimum*
ff. Plants caulescent with one stem leaf, 5–8 cm. tall; rays 1.5–2 mm. long; plants of the Wallowa Mts., Oregon....46. *L. Greenmanii*
qq. Plants more than 1 dm. tall; leaf blades more than 2.5 cm. long.
j. Leaflets ovate, crowded; fruit 13–16 mm. long; plants of high Cascade Mts., Oregon....54. *L. Martindalei*
jj. Leaflets linear to lanceolate, remote; fruit less than 12 mm. long; plants of the Great Basin mountains.
(a). Umbels 3–6-rayed; pedicels 4–10 mm. long....52a. *L. Nuttallii var. alpinum*
(aa). Umbels 4–11-rayed; pedicels 1–4 mm. long.
(l). Leaflets lanceolate, 2–6 mm. broad; central rays sterile....55. *L. latilobum*

(ll). Leaflets linear, about 1 mm. broad; central rays fertile.....56. *L. megarrhizum*

NN. Plants mostly caulescent, tall; leaves ternate-pinnately or quinate-pinnately divided.

V. Plants variously pubescent.

d. Ovaries and young fruit glabrous.

r. Leaflets linear; fruit 7–14 mm. long.

k. Leaves biternate; involucel bracts shorter than the pedicels; fruit 7–14 mm. broad, the wings equalling to broader than the body.....57. *L. simplex*

kk. Leaves ternate-pinnate; involucel bracts equalling the pedicels; fruit 3–5 mm. broad, the wings narrower than the body.....58. *L. triternatum*

rr. Leaflets ovate-lanceolate to obovate; fruit 13–22 mm. long .....58a. *L. triternatum* var. *anomalum*

dd. Ovaries and young fruit pubescent.

s. Leaves biternate; wings equalling to broader than the body .....57a. *L. simplex* var. *leptophyllum*

ss. Leaves ternate-pinnate; wings narrower than the body.

m. Leaflets elongated, up to 14.5 cm. long.

(b). Leaflets linear; involucel bracts few or absent.... .....58d. *L. triternatum* var. *alatum*

(bb). Leaflets linear to ovate-lanceolate; involucel bracts several, equalling the pedicels..... .....58b. *L. triternatum* var. *macrocarpum*

mm. Leaflets shorter, up to 2.2 cm. long.

(c). Plants low, up to 3.5 dm. tall; pedicels 1–4 mm. long; fruit 6–8 mm. long..... .....58c. *L. triternatum* var. *brevifolium*

(cc). Plants 9–21 dm. tall; pedicels 6–17 mm. long; fruit 24–28 mm. long....61a. *L. Suksdorfii* var. *Thompsonii*

VV. Plants glabrous or rarely slightly scaberulent, never pubescent.

e. Plants 9–21 dm. tall; fruit 15–32 mm. long.....61. *L. Suksdorfii*

ee. Plants 1–5.6 dm. tall; fruit 6–13 mm. long.

t. Stems simple; leaflets filiform to linear; fruit never reflexed.

n. Plants 1–2.2 dm. tall; leaflets few; involucel bracts present; fruit 11–13 mm. long.....59. *L. Cusickii*

nn. Plants 2.5–3.7 dm. tall; leaflets many; involucel bracts usually absent; fruits 6–10 mm. long....60. *L. laevigatum*

tt. Stems few-branched; leaflets linear-lanceolate to oblanceolate; fruit usually reflexed.....62. *L. Brandegei*

AA. Peduncles swollen at the apex.....63. *L. nudicaule*

1. Lomatium lucidum (Nutt.) Jepson, Econ. Pl. Calif. 119. 1924; Madroño 1: 149. 1924.

Euryptera lucida Nutt. ex Torr. & Gray, Fl. N. Am. 1: 629. 1840.
Peucedanum Euryptera Gray, Proc. Am. Acad. 7: 348. 1868.

P. Hassei Coult. & Rose, Bot. Gaz. 14: 276. 1889.
Euryptera Hassei Coult. & Rose, Contr. U. S. Nat. Herb. 7: 242. 1900.
Cogswellia lucida (Nutt.) Jones, Contr. Western Bot. 12: 31. 1908.
C. Hassei (Coult. & Rose) Jones, Contr. Western Bot. 12: 31. 1908.

Plants short-caulescent, 2.6–5 dm. tall, glabrous, from a long slender tap-root; leaves ovate-oblong to obovate, the blades 4.5–9 cm. long, 1–2-ternate, the leaflets deltoid to cuneate, 15–70 mm. long, 10–65 mm. broad, entire or 3-lobed, regularly and sharply dentate, the petioles 2.5–14 cm. long, sheathing below; fruiting peduncles exceeding the leaves, stout; umbels 10–20-rayed, the fruiting rays 2–8.5 cm. long, spreading; involucel bracts linear-lanceolate, acuminate, distinct or connate below, about equalling the yellow flowers; umbellets about 20-flowered, the fruiting pedicels 7–17 mm. long; fruit suborbicular to broadly elliptical, 6–15 mm. long, 5–15 mm. broad, emarginate especially at the base, the wings thick, broader than the body, the oil tubes solitary in the intervals, 2–4 on the commissure.

TYPE: *Nuttall*, "woods of San Diego," California (Ph).[1]

DISTRIBUTION: Coast ranges, southern California.

TYPICAL SPECIMENS: CALIFORNIA: foothills of Sierra Madre, Los Angeles Co., *Hasse* (M, NY, UC, US TYPE of *P. Hassei*); open rocky ridges, S. Fork, La Tuna Canyon, Verdugo Range, Los Angeles Co., *Ewan 4173* (M, UC).

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[1] The following abbreviations have been used in citations to indicate the different herbaria from which material has been obtained for study:

Cal—California Academy of Sciences.
Cl—Herbarium of Ira W. Clokey, South Pasadena, California.
F—Field Museum of Natural History.
G—Gray Herbarium, Harvard University.
Garrett—Herbarium of A. O. Garrett, Salt Lake City, Utah.
Jepson—Herbarium of W. L. Jepson, University of California.
M—Missouri Botanical Garden.
NY—New York Botanical Garden.
Ph—Academy of Natural Sciences, Philadelphia.
Po—Pomona College.
Sta. Barb.—Santa Barbara Museum.
Th—Herbarium of J. W. Thompson, Seattle, Washington.
UC—University of California.
UM—University of Montana.
UO—University of Oregon.
US—United States National Herbarium.

2. Lomatium repostum (Jepson) Mathias, comb. nov.

Lomatium lucidum (Nutt.) Jepson var. *repostum* Jepson, Madroño 1: 149. 1924.

Plants acaulescent, 1.5–3.6 dm. tall, glabrous, from a long slender, sometimes branching tap-root; leaves broadly ovate, the blades 5–15 cm. long, 1–2-ternate or ternate-pinnate, the leaflets ovate to subflabellate, 1–4 cm. long, 1–6 cm. broad, regularly and sharply dentate, rarely shallowly lobed, the petioles 3–17 cm. long, shortly sheathing below; peduncles exceeding the leaves; umbels 8–20-rayed, the fruiting rays 3–8 cm. long, spreading; involucel bracts lanceolate, subacuminate, dimidiate, usually connate below, about equalling the greenish-yellow flowers; umbellets about 20-flowered, the fruiting pedicels 8–12 mm. long; fruit broadly elliptical, 10–15 mm. long, 7–12 mm. broad, emarginate at base and apex, the wings thin, about equalling to much broader than the body, the oil tubes 1–3 in the intervals, 4–6 on the commissure.

TYPE: *Jepson*, near Collin's Spr., Vaca Mts., California.

DISTRIBUTION: Inner coast ranges, northern Napa and southern Lake counties, California.

SPECIMENS EXAMINED: CALIFORNIA: East slope Cobb. Mt., *Baker 2287a* (UC); edge of the "Crater Country," Napa Co., *Howell 5358* (UC); trail from Mt. St. Helena Inn to summit of Mt. St. Helena, about 2800 feet, *Mathias 1286* (UC); 7–8 miles from Lower Lake along road to Knoxville, Lake Co., *Mathias 1293, 1319* (UC).

3. Lomatium Howellii (Wats.) Jepson, Fl. Calif. 2[1]: 637. 1936.

Peucedanum Howellii Wats. Proc. Am. Acad. **20**: 369. 1885.

Euryptera Howellii (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 243. 1900.

Cogswellia Howellii (Wats.) Jones, Contr. Western Bot. **12**: 31. 1908.

Plants acaulescent or short-caulescent, 2.5–4 dm. tall, glabrous, from a long slender branching tap-root; leaves obovate, the blades 4.5–11 cm. long, ternate, then 1–2 pinnate, the leaflets deltoid, 10–25 mm. long, 8–30 mm. broad, entire to 3-lobed, sharply and regularly dentate, the petioles 2.5–7.5 cm. long, sheathing below; peduncles exceeding the leaves; umbels 10–

15-rayed, the fruiting rays spreading, 2.5–5.5 cm. long; involucel bracts several, lanceolate to filiform, about equalling the yellow flowers; umbellets about 20-flowered, the fruiting pedicels 8–12 mm. long; fruit suborbicular, 7–11 mm. long, 7–11 mm. broad, deeply emarginate at base and apex, the wings about equalling the body, the oil tubes 2–3 in the intervals, 9 on the commissure.

TYPE: *Howell*, near Waldo, Josephine Co., Oregon, June 1884 (NY).

DISTRIBUTION: Southwestern Oregon and adjacent California.

SPECIMENS EXAMINED: OREGON: dry rocky ground, 10 miles s. w. of Waldo, Josephine Co., *Thompson 4610* (M); Waldo, *Howell s. n.* (NY), *241*, *302* (US), *1153* (M); high hot hillsides, 5 miles down Deer Creek from Selma, *Henderson 5864* (M); 8 mi. south of Waldo, *Piper 6105* (US); dry hillsides of the Siskiyou Mts. on Waldo-Crescent City road, *Cusick 2930a* (US). CALIFORNIA: Sesquete, French Hill, Del Norte Co., *Eastwood 2207* (US).

4. Lomatium parvifolium (Hook. & Arn.) Jepson, Madroño 1: 150. 1924; Man. Fl. Pl. Calif. 720. 1925.

Ferula parvifolia Hook. & Arn. Bot. Beechey Voy. 348. 1840.

Peucedanum parvifolium (Hook & Arn.) Torr. & Gray, Fl. N. Am. 1: 628. 1840.

P. californicum Coult. & Rose, Bot. Gaz. **13**: 143. 1888, not Nutt. (1840).

Euryptera parvifolia (Hook & Arn.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 241. 1900.

Cogswellia parvifolia (Hook. & Arn.) K.-Pol. Bull. Soc. Nat. Mosc. 1915, n.s. **29**: 177. 1916.

Plants short-caulescent, 1.5–4 dm. tall, glabrous, from a long tap-root; leaves oblong, the blades 3–10 cm. long, ternate (rarely with confluent segments), then 1–2-pinnate, the leaflets lanceolate to cuneate, 8–24 mm. long, 7–15 mm. broad, irregularly and sharply pinnatifid-incised, the petioles 3–15 cm. long, shortly sheathing, purplish; peduncles exceeding the leaves; umbels 8–14-rayed, the fruiting rays subequal, 0.8–2.5 cm. long, spreading; involucel bracts linear-lanceolate to filiform, about equalling the yellow flowers; umbellets 14–20-flowered, the fruiting pedicels 3–6 mm. long; fruit orbicular to oblong, 7–10 mm. long, 6–10 mm. broad, emarginate at base and apex, the wings broader than the body, the oil tubes 1–2, mostly 1, in the dorsal intervals, 2–3 in the lateral intervals, 4–6 on the commissure.

TYPE: *Douglas*, California, probably near Monterey.
DISTRIBUTION: Coastal California, Monterey Co. to San Luis Obispo Co.
TYPICAL SPECIMENS: CALIFORNIA: Del Monte, Monterey Co., *Heller 8420* (M, NY, US); Monterey, *Elmer 4841* (M, NY); Pacific Grove, *Heller 6735* (M, NY, Po, UC, US).

4a. Lomatium parvifolium (Hook. & Arn.) Jepson var. **pallidum** (Coult. & Rose) Jepson, Madroño 1: 150. 1924.

Euryptera pallida Coult. & Rose, Contr. U. S. Nat. Herb. 7: 242. 1900.
Cogswellia pallida (Coult. & Rose) Jones, Contr. Western Bot. 12: 31. 1908.

Similar to the species but the foliage paler; rays 3–6.5 cm. long, the pedicels 7–17 mm. long.

TYPE: *Vasey 232*, Santa Lucia Mts., California, July 1880 (US TYPE, Po).
DISTRIBUTION: San Luis Obispo Co., California.
SPECIMENS EXAMINED: CALIFORNIA: School Canyon, San Luis Obispo Co., *Condit* (UC); Jolon, *T. S. Brandegee* (UC).

5. Lomatium insulare (Eastw.) Munz, Man. So. Calif. Bot. 358. 1935.

Peucedanum insulare Eastw. Proc. Calif. Acad. III, 1: 106. 1898.
Euryptera insularis (Eastw.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 243. 1900.
Cogswellia insularis (Eastw.) Jones, Contr. Western Bot. 12: 31. 1908.

Plants acaulescent, 1–4(?) dm. tall, glabrous, from a long stout tap-root; leaves ovate to obovate, the blades 6–9 cm. long, 2-3-ternate to biquinate, then pinnate, the leaflets oblong to ovate-oblong, cuneate, 4–14 mm. long, 2–8 mm. broad, irregularly pinnatifid, the petioles 2.5–3 cm. long, sheathing below; fruiting peduncles stout, exceeding the leaves; umbels 15–20-rayed, the fruiting rays subequal, 3.5–8 cm. long, spreading; involucel bracts filiform, exceeding the yellow flowers; umbellets many-flowered, the fruiting pedicels 6–12 mm. long; fruit oblong-ovate, 12–15 mm. long, 7–10 mm. broad, more or less emarginate at base and apex, the wings thick, about equalling the body, the oil tubes 2 in the intervals, 4 on the commissure, rarely 1 in the wings.

TYPE: *Trask*, sand cliffs overhanging briny arroyas, "San Nicholas Island," California, April 1897.
DISTRIBUTION: Known only from the type locality.
SPECIMENS EXAMINED: CALIFORNIA: San Nicolas Island, *Howell 8207* (Cal, M, UC), *Trask 51* (NY, US), *52* (M).

6. Lomatium rigidum (Jones) Jepson, Fl. Calif. 2[1]: 637. 1936.

Cogswellia rigida Jones, Contr. Western Bot. 13: 11. 1910.

Plants acaulescent or short-caulescent, 2.5–4 dm. tall, glabrous, from a cluster of dried leaf sheaths; leaves oblong, the blades 8–12 cm. long, bipinnate (the lower pinnae elongated, appearing ternate), the leaflets ovate to cuneate, 10–20 mm. long, 5–10 mm. broad, sharply pinnatifid, the lobes with acerose or spinulose teeth, the petioles 5–10 cm. long, shortly sheathing below; peduncles exceeding the leaves; umbels 10–20-rayed, the fruiting rays subequal, 2.5–5 cm. long, spreading; involucel bracts conspicuous, lanceolate, acuminate, about equalling the pedicels, reflexed in fruit; flowers yellow, the fruiting pedicels 5–10 mm. long; fruit ovate to oblong, 7–9 mm. long, 5–7 mm. broad, emarginate at base, somewhat rounded at apex, the wings less than one-half the width of the body; oil tubes 3 in the intervals, about 6 on the commissure, the calyx teeth conspicuous especially in the young fruit.

Type: *Hall and Chandler 7225*, rocky point north of the town, Big Pine, Inyo Co., California, 4000 feet, 30 May 1906 (Po, Jepson).

Distribution: Eastern slopes of the Sierras, Inyo Co., California, 4000 to 10,000 feet.

Specimens examined: California: Owen's Valley, *Austin 447a* (US); Andrew's Camp, *Davidson 2738* (US), *K. Brandegee* (Jepson); Big Pine Creek, *Hoffmann* (Sta. Barb.).

7. Lomatium Gormani (Howell) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 208. 1900.

Peucedanum Gormani Howell, Fl. N.W. Am. 1: 252. 1898 (April 1).
P. confusum Piper, Erythea 6: 29. 1898 (April 10).
P. Watsoni Coult. & Rose, in part, acc. to Howell (*loc. cit.* 1898).
Cogswellia Gormani (Howell) Jones, Contr. Western Bot. 12: 33. 1908.

Plants acaulescent, 1–1.5 dm. tall, from a shallow globose tuber up to 2.5 cm. in diameter, covered with fascicles of rootlets; leaves broadly oblong, the blades 3–5.5 cm. long, ternate, then 1–2-pinnate, the leaflets oblong to linear, 2–13 mm. long, about 1 mm. broad, acute, glabrous or sparingly puberulent, the petioles 2.5–7 cm. long, scarious, sheathing throughout; peduncles exceeding the leaves, glabrous or sparingly puberu-

lent; umbels 4–10-rayed, the rays unequal, 0.6–3 cm. long; involucel bracts absent or few, setaceous, scarious-margined, exceeding the pedicels; umbellets 10–20-flowered, the flowers white, the anthers purple, the fruiting pedicels 0.5–3 mm. long; fruit ovate, 5–7 mm. long, 4–5 mm. broad, puberulent, the wings about half the width of the body, the oil tubes 3–4 in the intervals, 4–6 on the commissure.

TYPE: *Howell*, "high hills opposite the Dalles," probably Klickitat Co., Washington.

DISTRIBUTION: Central and southeastern Washington, central Oregon, and Idaho.

TYPICAL SPECIMENS: WASHINGTON: Pullman, *Elmer 73* (M, NY, US). OREGON: hills near Pendleton, *Cusick 3411* (M, NY in part).

A form, **Lomatium Gormani** (Howell) Coult. & Rose forma **purpureum** St. John, Proc. Biol. Soc. Wash. **41**: 196. 1928 (*Cogswellia Gormani* (Howell) Jones forma *purpurea* St. John, Fl. S.E. Wash. & Adj. Ida. 290. 1937) has been described having the petals bright rose-purple. The type collection is by *St. John & Pickett 3714*, rocky hillside, Pullman, Whitman Co., Washington, March 5, 1926.

8. **Lomatium Piperi** Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 211. 1900.

Cogswellia Piperi (Coult. & Rose) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants acaulescent or short-caulescent, 1–2.5 dm. tall, glabrous or with somewhat puberulent foliage, from a small globose, sometimes deep-seated tuber; leaves oblong-ovate, the blades 3–7.5 cm. long, ternate, then tripinnate, the leaflets remote, linear, 3–30 mm. long, 1–2 mm. broad, obtuse to acute, the petioles 3.5–10 cm. long, sheathing below; peduncles exceeding the leaves; umbels 3–20-rayed, the rays unequal, 1–6 cm. long, spreading; involucel bracts absent or few, inconspicuous, linear, shorter than the white flowers; umbellets 6–13-flowered, the anthers purple, the fruiting pedicels absent or less than 2 mm. long; fruit ovate to oblong, 5–9 mm. long, 3–4 mm. broad, the wings half as broad as the body, the oil tubes 1–8 in the intervals, 2–4 on the commissure.

TYPE: *Vasey*, Ellensburg, "Spokane County" (Kittitas Co.), Washington, May 1889 (US).

DISTRIBUTION: Central Washington to northern California, east to western Idaho.

TYPICAL SPECIMENS: WASHINGTON: Goldendale, Klickitat Co., *Thompson 8188* (M, Th); Maryhill, Klickitat Co., *Thompson 8185* (M, Th). OREGON: Lookout Mountain, Crook Co., *Cusick 1687* (M, UC, US). CALIFORNIA: Yreka, *Butler 578* (Po, UC), *1115* (Po), *1130* (Po, UC).

9. Lomatium orogenioides (Coult. & Rose) Mathias, comb. nov.

Leibergia orogenioides Coult. & Rose, Contr. U. S. Nat. Herb. **3**: 575. 1896.
Cogswellia orogenioides (Coult. & Rose) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants acaulescent, slender, 1–4 dm. tall, from a globose tuber, 6–12 mm. in diameter; leaves oblong, the blades 5–11 cm. long, glabrous, 2–3-ternate, the leaflets few, filiform, 10–45 mm. long, 1–2 mm. broad, acute, minutely apiculate, petioles 2–7 cm. long, usually sheathing about to the middle; peduncles exceeding the leaves; umbels 3–10-rayed, the rays glabrous or sparsely scaberulent, unequal, 3–15 cm. long, ascending; involucel bracts few, linear, acute, exceeding the pedicels; umbellets about 10-flowered, the flowers white, the fruiting pedicels 1–3 mm. long; fruit linear, 8–10 mm. long, 1–1.5 mm. broad, constricted toward the apex, the wings narrow to almost obsolete, the oil tubes small, solitary in the intervals, 2 on the commissure.

TYPE: *Leiberg 1027*, "Santianne Creek bottoms, Coeur d'Alene Mts., Idaho," 950 m., 24 June 1895 (US).

DISTRIBUTION: Northern Idaho and northeastern Washington.

SPECIMENS EXAMINED: WASHINGTON: damp low bank of Latah Creek east of Spangle, Spokane Co., *Suksdorf 8645* (Th).

10. Lomatium farinosum (Geyer) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 210. 1900, where the name-bringing synonym is erroneously ascribed to Hook.

Peucedanum farinosum Geyer, ex Hook. Lond. Journ. Bot. **6**: 235. 1847.
Ferula farinosa Geyer, ex Hook. Lond. Journ. Bot. **6**: 235. 1847, nom. nud. in synon.
Cogswellia farinosa (Geyer) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants short-caulescent, 1.5–3 dm. tall, glabrous, from a globose tuber, 1–2 cm. in diameter; leaves oblong, the blades 4–10 cm. long, biternate, the leaflets linear, 1.5–8 cm. long, 1–3 mm. broad, acute, narrowed toward the base, the petioles 1–7 cm.

long, sheathing at the base; peduncles exceeding the leaves; umbels 3–12-rayed, the rays unequal, 1–7 cm. long, weak, ascending; involucel bracts one to few, linear, acuminate, sometimes scarious, deciduous, shorter than the pedicels; umbellets 12–15-flowered, the flowers white, the fruiting pedicels 6–17 mm. long, weak; fruit linear-oblong, 5–6 mm. long, about 3 mm. broad, the wings narrow, about half the width of the body; the oil tubes several in the intervals.

TYPE: *Geyer 325*, "on an isolated rock in the Coeur d'Aleine Mountains on wet clay," Idaho.

DISTRIBUTION: Western Idaho and adjacent Washington.

TYPICAL SPECIMENS: IDAHO: Lewiston, Nez Perce Co., *Heller & Heller 3036* (M, US). WASHINGTON: near Rock Creek, Spokane Co., *Sandberg & Leiberg 131* (M, Po, UC, US); Almata, *Piper 2794* (Po, US).

11. Lomatium Geyeri (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 209. 1900.

Peucedanum ambiguum acc. to Hook. Lond. Journ. Bot. **6**: 235. 1847, not Nutt. (1840).

P. Geyeri Wats. Bibl. Ind. **1**: 428. 1878; Proc. Am. Acad. **14**: 293. 1879.

P. evittatum Coult. & Rose, Bot. Gaz. **14**: 277. 1889.

Cogswellia Geyeri (Wats.) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants acaulescent, 2–4.5 dm. tall, glabrous, from a shallow or deep-seated small tuber less than 1 cm. in diameter; leaves ovate-oblong, the blades 7–9 cm. long, ternate, then pinnate, the leaflets few, remote, linear, 10–50 mm. long, 1.5–3 mm. broad, apiculate, the petioles 7–13 cm. long, purplish, shortly sheathing below; peduncles exceeding the leaves; umbels 5–20-rayed, the rays unequal, 1–6 cm. long, spreading to ascending; involucel bracts more or less connate, linear-lanceolate, acuminate, scarious-margined, about equalling the white flowers; umbels several-flowered, anthers purple, the fruiting pedicels 2–5 mm. long; fruit ovate-oblong, 6–13 mm. long, 4–5 mm. broad, the wings narrower than the body, the oil tubes small, obscure, 2–6 in the intervals, about 6 on the commissure.

TYPE: *Geyer 458*, "sandy woods and plains, Upper Columbia River," April, May.

DISTRIBUTION: Eastern British Columbia to central Washington.

TYPICAL SPECIMENS: WASHINGTON: along Beverly Creek, Kittitas Co., *Thompson 9594* (Po, Th); rocky ledges near Salmon La Sac, Kittitas Co., *Thompson 10465* (Po, Th); Tumwater Mt., Wenatchee Mts., Chelan Co., *Thompson 6492* (M, Th), *10499* (Po, Th).

12. Lomatium Hendersoni Coult. & Rose, Contr. U. S. Nat. Herb. 7: 209. 1900.

Peucedanum Hendersoni Coult. & Rose, Bot. Gaz. 13: 210. 1888; Rev. N. Am. Umbell. 56. 1888.

Cogswellia Hendersoni (Coult. & Rose) Jones, Contr. Western Bot. 12: 33. 1908.

Plants acaulescent, low, mostly glabrous, from a shallow constricted tuber 1–2.5 cm. in diameter; leaves ternate, then bipinnate, the leaflets short, obtuse; umbels 2–5-rayed, the rays equal, 1–2 cm. long; involucel bracts linear, acuminate, scarious, distinct; umbellets few-flowered, the flowers white, the pedicels 3–4 mm. long; fruit ovate, 5 mm. long, 4 mm. broad, glabrous, the wings thickish, less than half as broad as the body, more or less involute, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Howell B* in part, on high hilltops, John Day Valley, Oregon, May 1882. Associated with the type is *Howell 410*, Lost Valley, June 1882.

DISTRIBUTION: Known only from the type collections.

This species has not been seen and the description is an adaptation from the publications of Coulter and Rose.

13. Lomatium Canbyi Coult. & Rose, Contr. U. S. Nat. Herb. 7: 210. 1900.

Peucedanum Canbyi Coult. & Rose, Bot. Gaz. 13: 78. 1888; Rev. N. Am. Umbell. 56. 1888.

Cogswellia Canbyi (Coult. & Rose) Jones, Contr. Western Bot. 12: 33. 1908.

Plants acaulescent, 1.5–2 dm. tall, glabrous, from a thick, more or less elongated rootstock ending in a globose tuber 1–2.5 cm. in diameter; leaves oblong-ovate, the blades 7–9 cm. long, ternate, then bipinnate, the leaflets distinct, linear, 4–5 mm. long, about 1 mm. broad, obtuse, mucronulate, the petioles 4–6 cm. long, forming a conspicuous scarious, purple-veined sheath; peduncles solitary, exceeding the leaves; umbels 12–17-rayed, the rays subequal, 2.7–5.5 cm. long, spreading; involucel bracts linear, acute to subacuminate, about equalling the white flowers; umbellets 13–16-flowered, the fruiting pedicels 8–12 mm. long; fruit elliptic-oblong, 7–10 mm. long, 4–6

mm. broad, the wings narrower than the body, the oil tubes 1–2 in the intervals, 2–4 on the commissure.

TYPE: *Howell 67*, high ridges, E. Oregon, April 1880, May 1882.
DISTRIBUTION: Western Idaho, eastern Washington, and Oregon.
TYPICAL SPECIMENS: WASHINGTON: Klickitat Valley, *Howell 1367* (M, UC, US). OREGON: *Cusick 1834* (M, Po, UC, US); summit of Tygh Hill, Wasco Co., *Thompson 4073* (M).

14. Lomatium Watsoni Coult. & Rose, Contr. U. S. Nat. Herb. 7: 211. 1900.

Peucedanum Watsoni Coult. & Rose, Bot. Gaz. 13: 209. 1888; Rev. N. Am. Umbell. 57. 1888.
Cogswellia Watsoni (Coult. & Rose) Jones, Contr. Western Bot. 12: 33. 1908.

Plants acaulescent, more or less puberulent, 0.8–1.5 dm. tall, from a deep-seated solitary oblong tuber, with clusters of rootlets on its surface; leaves oblong, the blades 1.5–3.5 cm. long, 2–4-pinnate, the leaflets crowded, linear, 1–5 mm. long, about 0.5 mm. broad, apiculate, the petioles 3–4.5 cm. long, sheathing partially or entirely, scarious; peduncles exceeding the leaves; umbels 1–9-rayed, the fruiting rays unequal, 0.5–2.5 cm. long, ascending; involucel bracts scarious, dimidiate, connate to near the apex, about equalling the yellow flowers; umbellets many-flowered, the fruiting pedicels obsolete to 1 mm. long; fruit ovate, 6–7 mm. long, about 3 mm. broad, puberulent, the wings less than half the width of the body, the oil tubes obscure, several in the intervals, about 6 on the commissure.

TYPE: *Howell*, Cimcoe Mts., Washington, 1881, is the first specimen cited in the original publication; in the Contr. U. S. Nat. Herb. 7: 212, the type is given by Coulter and Rose as *Howell 830*, on denuded hilltops near "Alkali," Oregon, 20 May 1882.
DISTRIBUTION: Central and western Washington, and the Blue Mts., Oregon.
SPECIMENS EXAMINED: WASHINGTON: "Cimcoe Mountains," *Howell 180* (US); high hills opposite The Dalles, Klickitat Co., *Thompson 11416* (Th); Yakima Region, *T. S. Brandegee 320* (UC). OREGON: near Alkali, *Howell 830* (Th, UC, US); Trout Creek, Blue Mts., *Howell* (US).

15. Lomatium leptocarpum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 213. 1900.

Peucedanum leptocarpum Nutt. ex Torr. & Gray, Fl. N. Am. 1: 626. 1840, nom. nud. in synon.

P. triternatum (Pursh) Nutt. var. *leptocarpum* Torr. & Gray, Fl. N. Am. 1: 626. 1840.
P. bicolor Wats. Bot. King Exp. 129. 1871.
P. ambiguum Nutt. var. *leptocarpum* (Torr. & Gray) Coult. & Rose, Rev. N. Am. Umbell. 59. 1888.
Lomatium bicolor (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 237. 1900.
Peucedanum bicolor Wats. var. *gumbonis* Jones, Contr. Western Bot. 10: 55. 1902.
Cogswellia bicolor (Wats.) Jones, Contr. Western Bot. 12: 33. 1908.
C. leptocarpa (Nutt.) Jones, Contr. Western Bot. 12: 33. 1908.
Lomatium ambiguum (Nutt.) Coult. & Rose var. *leptocarpum* (Torr. & Gray) Jepson, Madroño 1: 159. 1924.

Plants short-caulescent, 1.5–5.5 dm. tall, glabrous to scaberulent, from elongated moniliform tuberous roots; leaves broadly obovate, the blades 9–14 cm. long, 1–2-ternate, then 2–4-pinnate, the leaflets filiform to linear, 0.5–45 mm. long, 0.1–2 mm. broad, mucronulate, the petioles 2.2–7 cm. long, entirely sheathing; peduncles exceeding the leaves; umbels 4–15-rayed, the rays unequal, 2–12 cm. long, suberect, strict; involucel bracts several, linear, acute, about equalling the yellow flowers; umbellets 10–16-flowered, the fruiting pedicels 2–7 mm. long; fruit narrowly oblong, 10–15 mm. long, 2–5 mm. broad, the wings less than half the width of the body, the oil tubes solitary in the intervals, 2–4 on the commissure.

TYPE: *Nuttall*, "Plains of the Oregon near the confluence of the Wahlamet," Oregon, July (Ph).

DISTRIBUTION: Northwestern Colorado to northeastern California, northern Idaho to the Grand Canyon, Arizona.

TYPICAL SPECIMENS: UTAH: Salt Lake City, *Jones* (M, NY, Po, US), *Watson 467* (US, NY). OREGON: stony swales, *Cusick 2381* (M, NY, Po, US); Paradise, Wallowa Co., *Cusick 2414* (M, NY, US).

The type specimen in the herbarium of the Academy of Natural Sciences, Philadelphia, labelled *Nuttall*, "Wahlamet & Columbia plains," is a mixture of material. The fruit is true *L. leptocarpum*.

16. Lomatium ambiguum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 212. 1900.

Eulophus ambiguus Nutt. Journ. Acad. Phila. 7: 27. 1834.
Peucedanum ambiguum Nutt. ex Torr. & Gray, Fl. N. Am. 1: 626. 1840.

P. abrotanifolium Nutt. Journ. Acad. Phila. n.s. **1**: 184. 1847.
P. tenuissimum Geyer, ex Hook. Lond. Journ. Bot. **6**: 235. 1847.
Cogswellia ambigua (Nutt.) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants caulescent, 6–44 cm. tall, glabrous, solitary or clustered at the base, alternately few-branched above, the stems purplish, especially above, from tuberous somewhat moniliform roots or elongated tap-roots; leaves oblong-ovate, the blades 2.5–12 cm. long, the lower leaves mostly ternate, then once pinnate, the upper leaves 2–3-pinnate, the leaflets mostly distinct, linear, 3–50 mm. long, 1–4 mm. broad, acute, the petioles 1–6.5 cm. long, conspicuously sheathing at the base; peduncles 2–12 cm. long, the axillary umbels mostly sterile; umbels 5–17-rayed, the rays unequal, 15–80 mm. long; involucels absent; umbellets about 20-flowered, the flowers yellow, the fruiting pedicels 4–8 mm. long; fruit narrowly oblong, 8–10 mm. long, 1.5–3 mm. broad, glabrous, the wings very narrow, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Wyeth*, borders on "Flat-Head River, Oregon," Montana (Ph).

DISTRIBUTION: Western Montana and Wyoming to eastern British Columbia and the eastern slopes of the Cascade Mts., Washington, the Blue and Wallowa Mts., Oregon.

TYPICAL SPECIMENS: MONTANA: Flathead-Brackett Cr. Divide, *Blankinship 221* (M, UM, US); Bridger Mts., *Rydberg & Bessey 4623* (NY, UM, US). YELLOWSTONE NATIONAL PARK: Druid Peak, *A. & E. Nelson 5782* (M, NY, US). WYOMING: Crandall Creek, *Rose 274* (M, NY, US). IDAHO: Lewiston, Nez Perce Co., *Heller & Heller 2995* (M, NY, UC, US). WASHINGTON: Pullman, *Elmer 827* (M, NY, Po, US); Peshastin, *Sandberg & Leiberg 481* (M, NY, UC, US).

17. Lomatium Cous (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 214. 1900.

Peucedanum Cous Wats. Proc. Am. Acad. **21**: 453. 1886.
Cogswellia Cous (Wats.) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants acaulescent or short-caulescent, 2–2.5 dm. tall, from a globose, sometimes more or less elongated, tuber; leaves oblong to obovate, the blades 5.5–9.5 cm. long, mostly glabrous, ternate, then 2–3-pinnate or pinnately decompound, the leaflets crowded, ovate to oblong, 1–5 mm. long, 1–2 mm. broad, mucronulate, the petioles 3–6 cm. long, sheathing to above the middle; peduncles exceeding the leaves, scaberulent; umbels 10–20-rayed, the rays unequal, 1–5 cm. long, spreading; in-

volucel bracts oblanceolate, shortly connate below, about equalling the yellow flowers; umbellets about 20-flowered, the fruiting pedicels 2–4 mm. long; fruit oblong-elliptic, 7–10 mm. long, 3–5 mm. broad, granular-roughened, the wings narrower than the body, the oil tubes usually solitary in the intervals, 4 on the commissure.

TYPE: *Howell 270*, John Day's Valley, eastern Oregon, May 1880.

DISTRIBUTION: Western Idaho, adjacent Washington, and Oregon.

SPECIMENS EXAMINED: IDAHO: about Lewiston, Nez Perce Co., *Heller & Heller 3052* (M, UC). WASHINGTON: Wawawai, Whitman Co., *Elmer 97* (M). OREGON: Laka, Blue Mts., *Henderson 400* (M); *Howell* (M); Juniper Mt., Malheur Co., Wallowa Hill, Union Co., *Cusick 2377* (M, Po); near Fossil, Wheeler Co., *Henderson 5514* (M); *Cusick 1837* (M, Po, UC); near Prairie City, Grant Co., *Henderson 5183* (M).

The Indian name for this plant is "cous." The roots are used for food.

18. Lomatium montanum Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 214. 1900.

Lomatium purpureum A. Nels. Bull. Torrey Bot. Club **28**: 226. 1901.

Peucedanum montanum (Coult. & Rose) Blankinship, Mont. Agric. Coll. Studies, Bot. **1**: 93. 1905.

Cogswellia montana (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34, 36. 1908.

Plants acaulescent, 1–3 dm. tall, glabrous, caespitose from a thickened tap-root or a subglobose tuber; leaves mostly oblong, the blades 2.5–12 cm. long, ternate, then 2–3-pinnate, the leaflets crowded, oblong, 2–10 mm. long, 0.5–3 mm. broad, apiculate, the petioles 1.5–7 cm. long, sheathing to above the middle, purplish; peduncles exceeding the leaves; umbels 5–15-rayed, the fruiting rays unequal, 1–6.5 cm. long; involucel bracts conspicuous, obovate, distinct or united below, purplish; umbellets about 20-flowered, the fruiting pedicels 2–3 mm. long; fruit elliptic-oblong, 5–12 mm. long, 3–5 mm. broad, the wings narrower than to about equalling the body, the oil tubes 2–4 in the intervals, 6 on the commissure.

TYPE: *Eose 479*, mountain ridges in Yellowstone National Park, 19 August 1893 (US).

DISTRIBUTION: Mountains, western Montana and Wyoming, west to eastern Oregon.

TYPICAL SPECIMENS: MONTANA: Mt. Bridger, Mystic Lake, *Blankinship 223* (M, UM, US). YELLOWSTONE NATIONAL PARK: Madison River, *Nelson & Nelson 5496* (M, Po, US).

19. Lomatium circumdatum (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 213. 1900.

Peucedanum circumdatum Wats. Proc. Am. Acad. **22**: 474. 1887.
Cogswellia circumdata (Wats.) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants caulescent, 1.5–3.5 dm. tall, glabrous to somewhat pubescent, from an elongated to subglobose tuber; leaves broadly oblong, the blades 5–6 cm. long, ternate, then 1–2-pinnate, the leaflets distinct, linear, 6–10 mm. long, 1–2 mm. broad, apiculate, the petioles 3–6 cm. long, entirely scarious sheathing in the stem leaves; peduncles exceeding the leaves; umbels 7–12-rayed, the fruiting rays ascending, 2–8 cm. long; involucel bracts conspicuous, obovate, acute, prominently nerved, sometimes connate, much longer than the yellow flowers; umbellets many-flowered, the fruiting pedicels 2–3 mm. long; fruit oblong, 6–9 mm. long, 3–4 mm. broad, glabrous, the wings much narrower than the body, the oil tubes solitary in the intervals, 4 on the commissure.

TYPE: *Cusick*, "abundant on hillsides in the Wallowa region of eastern Oregon," June 1886.

DISTRIBUTION: Western Idaho and adjacent Washington and Oregon.

SPECIMENS EXAMINED: IDAHO: on the lower Clearwater River, Nez Perce Co., *Sandberg, MacDougal & Heller 21* (Po, US); near Lewiston, Nez Perce Co., *Heller & Heller 4043* (Po); Julietta, Hatwai Co., Lake Waha, *Henderson 4847* (US). WASHINGTON: Blue Mts., Walla Walla Co., *Piper 2341* (Po). OREGON: Billy Meadows, Wallowa National Forest, *Jardine 198* (US); near Harper Ranch, Malheur Co., *Leiberg 2123* (US); dry hills of the Wallowa, *Cusick 1394* (US type coll., UC); Buckhorn Springs, Wallowa Co., *Peck 18285* (Th); dry slope 15 mi. n. e. of Enterprise, Wallowa Co., *Peck 17467* (Th).

20. Lomatium vaginatum Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 223. 1900.

Cogswellia vaginata (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34. 1908.

Plants caulescent, 2.3–4.5 dm. tall, more or less scabrous, from an elongated, more or less thickened root; leaves ovate, the blades 5–13 cm. long, ternate, then 1–2-pinnate, the leaflets crowded, oblong, 1–5 mm. long, about 1 mm. broad, apiculate,

the petioles 1.5–9 cm. long, entirely sheathing in the stem leaves; peduncles exceeding the leaves; umbels 14–25-rayed, the fruiting rays 6–12, unequal, 1–4.5 cm. long, ascending; involucel bracts conspicuous, oblanceolate to obovate, acute; umbellets many-flowered, the flowers yellow, the fruiting pedicels 3–8 mm. long; fruit broadly elliptical to somewhat obovate, 8–12 mm. long, 5–8 mm. broad, granulate-roughened, the wings nearly as broad as the body, the oil tubes 3–4 in the intervals, 4 on the commissure.

TYPE: *Cusick 1655* ("1697"), Logan Valley, Union Co., Oregon (US TYPE, M, Po, UC).

DISTRIBUTION: Eastern Oregon and northeastern California.

SPECIMENS EXAMINED: OREGON: near Beulah, Malheur Co., *Leiberg 2293* (Po, UC); Owyhee, Malheur Divide, *Leiberg 2160* (UC); 10 mi. north of Mitchell, Wheeler Co., *Peck 16020* (Th); Lakeview, *Peck 15254* (Th); Barren Valley, *Cusick 2563* (M, Po in part).

21. Lomatium utriculatum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 215. 1900.

Peucedanum utriculatum Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 628. 1840.

Cogswellia caruifolia (Hook. & Arn.) Jones var. *patens* Jones, Contr. Western Bot. **12**: 41. 1908.

C. utriculata (Nutt.) Jones, Contr. Western Bot. **12**: 34. 1908.

C. Chandleri Jones, Contr. Western Bot. **13**: 11. 1910.

Lomatium Chandleri (Jones) Macbr. Contr. Gray Herb. n.s. **53**: 15. 1918.

L. utriculatum (Nutt.) Coult. & Rose var. *glabrum* Jepson, Madroño **1**: 152. 1924.

L. utriculatum (Nutt.) Coult. & Rose var. *anthemifolium* Jepson, Fl. Calif. **2**: 639. 1936.

Plants caulescent, 1–5 dm. tall, glabrous to pubescent, purplish below, from a long slender tap-root; leaves oblong, the blades 2.5–16 cm. long, tripinnate, sometimes ternate, then tripinnate, the leaflets linear, 2–25 mm. long, 0.5–3 mm. broad, apiculate, the petioles 1–10 cm. long, wholly sheathing except in some of the basal leaves; terminal peduncles exceeding the leaves; umbels 5–13-rayed, the fruiting rays unequal, 1–12 cm. long, spreading to ascending; involucel bracts obovate, entire to cleft, green with a scarious margin to purplish and subscarious, occasionally prominently nerved, about equalling the yellow flowers; umbellets about 20-flowered, the fruiting pedicels 2–9 mm. long; fruit ovate to oblong, 5–11 mm. long, 3–8

mm. broad, puberulent when young, becoming glabrous, the wings thin, mostly broader than the body, the oil tubes 1–3 in the dorsal intervals, 1–4 in the lateral intervals, 2–6 on the commissure, rarely obscure.

TYPE: *Nuttall*, "rocky plains, particularly near the confluence of the Wahlamet and Oregon Rivers," Oregon (Ph).

DISTRIBUTION: British Columbia to southern California.

TYPICAL SPECIMENS: WASHINGTON: Lopez, San Juan Islands, *Zeller & Zeller 1259* (M, NY); Goose Rock, Whidby Island, Island Co., *Thompson 6041, 8934* (M, NY, UC). CALIFORNIA: near Lakeport, Lake Co., *Baker 3063* (M, NY, UC); Nelson Range, Inyo Co., *Hall & Chandler 7157* (UC); grade between Clear Creek and Paradise, Butte Co., *Heller & Brown 5542* (M, NY); *Bridges 131* (NY).

21a. Lomatium utriculatum (Nutt.) Coult. & Rose var. **papillatum** (Henderson) Mathias, comb. nov.

Cogswellia utriculata (Nutt.) Jones var. *papillata* Henderson, Rhodora **33**: 204. 1931.

Similar to the species but the mature fruit roughened with budlike 1–several-celled papillae.

TYPE: *Henderson 12614*, south slope of Siskiyou Mts., in copses near the California line, Jackson Co., Oregon, 17 May, 12 June 1930 (UO).

DISTRIBUTION: Oregon.

22. Lomatium Vaseyi Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 216. 1900.

Peucedanum Vaseyi Coult. & Rose, Bot. Gaz. **13**: 144. 1888; Rev. N. Am. Umbell. 67. 1888.

Cogswellia Vaseyi Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 451. 1909.

C. caruifolia (Hook. & Arn.) Jones var. *Vaseyi* (Coult. & Rose) Jones, Contr. Western Bot. **12**: 41. 1908.

Plants caulescent, 2.5–3.5 dm. tall, sparsely to densely pubescent with pilose hairs, from a long somewhat thickened taproot; leaves broadly oblong, the blades 4–8 cm. long, ternate, then bipinnate, the leaflets oblong, 3–17 mm. long, 0.5–1 mm. broad, apiculate, the petioles 1.5–7 cm. long, partially to wholly sheathing in the stem leaves; peduncles exceeding the leaves; umbels 10–20-rayed, the fruiting rays unequal, 2–7.5 cm. long, ascending; involucel bracts obovate, scarious-margined, entire or lobed toward the apex, glabrous or villosulose, about equaling the yellow flowers; umbellets about 30-flowered, the fruiting

pedicels 3–8 mm. long; fruit ovate to obovate, 9–15 mm. long, 5–10 mm. broad, glabrous, the wings thin, usually broader than the body, the dorsal ribs filiform, the oil tubes solitary in the intervals, 4 on the commissure, the calyx lobes prominent, especially in the young fruit.

TYPE: *Vasey 231*, San Bernardino Mts., California, May 1880.

DISTRIBUTION: Southern California, southern Inyo Co. to San Luis Obispo Co., south to San Diego Co.

TYPICAL SPECIMENS: CALIFORNIA: San Jacinto, *Jones 5172* (M, NY, UC); Highland, San Bernardino Co., *Parish* (NY, UC); San Bernardino, *Parish 4699* (NY, UC).

23. Lomatium caruifolium (Hook. & Arn.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 216. 1900.

Ferula caruifolia Hook. & Arn. Bot. Beechey Voy. 348. 1840.

Peucedanum caruifolium (Hook. & Arn.) Torr. & Gray, Fl. N. Am. 1: 628. 1840.

P. californicum Nutt. ex Torr. & Gray, Fl. N. Am. 1: 628. 1840, *nom. nud.* in synon., not of Coult. & Rose (1888).

Cogswellia caruifolia (Hook. & Arn.) Jones, Contr. Western Bot. 12: 34. 1908.

Lomatium caruifolium (Hook. & Arn.) Coult. & Rose var. *solanense* Jepson, Madroño 1: 151. 1924.

L. caruifolium (Hook. & Arn.) Coult. & Rose var. *erythropodum* Jepson, Fl. Calif. 2[1]: 638. 1936.

Plants acaulescent or short-caulescent, 2–3 dm. tall, glabrous to slightly pubescent, from a long slender tap-root; leaves broadly ovate to obovate, the blades 9–11 cm. long, 1–3-ternate, or simply ternate, then bipinnate, the leaflets linear, 2–15 mm. long, about 1 mm. broad, apiculate, the petioles 4–7 cm. long, wholly inflated; peduncles exceeding the leaves; umbels 4–11-rayed, the rays unequal, 1.3–12 cm. long; involucel bracts obovate, sessile or petiolulate, entire or toothed, green to purplish, scarious-margined, prominently veined, equalling the yellow flowers; umbellets many-flowered, the fruiting pedicels 1–10 mm. long; fruit narrowly ovate to obovate, 7–8 mm. long, about 5 mm. broad, glabrous, the wings thickish, narrower than the body, the oil tubes obscure.

TYPE: *Douglas*, California.

DISTRIBUTION: Coast ranges, San Luis Obispo Co. to Humboldt and Trinity counties, California.

TYPICAL SPECIMENS: CALIFORNIA: San Luis Obispo, *Jones 3600* (M, Po, NY); Crystal Springs Lake, San Mateo Co., *Baker 426* (M, NY, Po, UC); Castroville, Monterey Co., *Elmer 4753* (M, NY, UC).

23a. Lomatium caruifolium (Hook. & Arn.) Coult. & Rose var. **denticulatum** Jepson, Madroño 1: 151. 1924.

Peucedanum crosum Jepson, Erythea 5: 1. 1897.

Rays unequal, 6.5–14 cm. long; wing margins roughened or denticulate.

TYPE: *Eastwood*, Exeter, Tulare Co., on the east side of the San Joaquin Valley, California, 26 May 1895.

DISTRIBUTION: Known only from the type collection.

23b. Lomatium caruifolium (Hook. & Arn.) Coult. & Rose var. **marginatum** (Benth.) Mathias, comb. nov.

Peucedanum marginatum Benth. Pl. Hartw. 312. 1849.

Lomatium marginatum (Benth.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 223. 1900.

Cogswellia marginata (Benth.) Jones, Contr. Western Bot. 12: 35. 1908.

Lomatium alatum acc. to Jepson, Man. 724. 1925, not Coult. & Rose (1900).

Plants rarely short-caulescent, mostly taller than the species; leaf-blades up to 20 cm. long, the leaflets remote, filiform to linear, 0.5–4.5 cm. long, the petioles 13 cm. long; involucel bracts linear, rarely absent, distinct, subacuminate, white-scarious-margined, rarely toothed at the apex, exceeding the yellow flowers; fruiting pedicels up to 13 mm. long; fruit up to 10 mm. long.

TYPE: *Hartweg 1752 (260)*, "in valle Sacramento," California (G type coll.).

DISTRIBUTION: Western slopes of the northern Sierra Nevada foothills, California.

SPECIMENS EXAMINED: CALIFORNIA: 8 miles north of Oroville, Butte Co., *Heller 11769* (Cl); Salmon Falls, Eldorado Co., *K. Brandegee* (UC); near Jenny Lind, Calaveras Co., *Stanford 1207* (M); New York Ravine, Eldorado Co., *K. Brandegee* (UC); near Collegeville, San Joaquin Co., *Stanford 847* (Po).

The specimens cited above apparently belong to this variety although they differ from the type in having the leaflets usually filiform instead of linear, the involucels sometimes wanting, and the pedicels mostly shorter.

This variety seems to be a robust form of the species but can be distinguished by its involucel bracts.

23c. Lomatium caruifolium (Hook. & Arn.) Coult. & Rose var. **purpureum** (Jepson) Mathias, comb. nov.

Lomatium alatum Coult. & Rose var. *purpureum* Jepson, Madroño 1: 158. 1924.
L. marginatum (Benth.) Coult. & Rose var. *purpureum* Jepson, Fl. Calif. 2: 645. 1936.

Leaflets filiform, usually longer than in the species; involucel bracts filiform to lanceolate, rarely oblanceolate; flowers purple.

TYPE: *Jepson*, Conn Valley, Napa Range, California.
DISTRIBUTION: Known only from Napa Co., California.
SPECIMENS EXAMINED: CALIFORNIA: Butts Valley Road to Middletown, 5 miles from Aetna Springs, *Howell 6148* (UC); 5 mi. n. e. of Aetna Springs along Butts Creek, *Keck 1076* (M, Po); Knoxville, *Baker 2971* (M, Po); 1.9 mi. southeast of Napa-Lake Co. line, on Knoxville Road, *Mathias 1298* (UC).

24. Lomatium nevadense (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 220. 1900.

Peucedanum nevadense Wats. Proc. Am. Acad. 11: 143. 1876.
P. nudicaule acc. to Wats. Bot. King Exp. 130. 1871, and others, not Nutt. (1840), in part (excl. *Hall & Harbour 212* and Parry's Colorado collection).
P. nevadense Wats. var. *cupulatum* Jones, Contr. Western Bot. 8: 29. 1898.
Lomatium nevadense (Wats.) Coult. & Rose var. *cupulatum* (Jones) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 221. 1900.
Cogswellia nevadensis (Wats.) Jones, Contr. Western Bot. 12: 33. 1908.
C. nevadensis (Wats.) Jones var. *cupulata* Jones, Contr. Western Bot. 12: 33. 1908.

Plants acaulescent or short-caulescent, 1–4.5 dm. tall, pubescent, from a long slender tap-root; leaves oblong to obovate, the blades 5–6 cm. long, tripinnate, the leaflets crowded, oblong, 2–3 mm. long, about 1 mm. broad, apiculate, the petioles 4–6 cm. long, sheathing to above the middle, purplish; peduncles exceeding the leaves; umbels 8–22-rayed, the fruiting rays unequal, 1–2.5 cm. long, spreading; involucel bracts conspicuous, about equalling the white flowers, linear and distinct or obovate and connate, scarious-margined; umbellets about 20-flowered, the fruiting pedicels 3–10 mm. long; fruit more or less puberulent, ovate to oblong-obovate, 6–8 mm. long, 4–6 mm. broad, the wings narrower than the body, the oil tubes 2–9 in the intervals, 4–12 on the commissure.

TYPE: *Watson 469*, "very frequent in western Nevada from the Washoe to the West Humboldt Mountains," 4500–6000 feet (US TYPE, NY).

DISTRIBUTION: Western Utah to Oregon and eastern California, south to southern Arizona.

TYPICAL SPECIMENS: NEVADA: north of Reno, Washoe Co., *Heller 10243* (M, NY, US); Empire City, *Jones 3880* (M, NY, Po, US). CALIFORNIA: Prosser Creek near Truckee, Nevada Co., *Sonne 358* (M).

24a. Lomatium nevadense (Wats.) Coult. & Rose var. **Parishii** (Coult. & Rose) Jepson, Madroño 1: 156. 1924.

Peucedanum Parishii Coult. & Rose, Bot. Gaz. 13: 209. 1888.
Lomatium Parishii Coult. & Rose, Contr. U. S. Nat. Herb. 7: 235. 1900.
Cogswellia nevadensis (Wats.) Jones var. *Parishii* (Coult. & Rose) Jones, Contr. Western Bot. 12: 33. 1908.
C. decipiens Jones, Contr. Western Bot. 12: 34, 38. 1908.
C. Parishii Coult. & Rose, Contr. U. S. Nat. Herb. 12: 450. 1909.

Mostly taller than the species, leaf segments sometimes elongate, up to 35 mm. long; rays usually longer, 1.5–5.5 cm. long; involucel bracts sometimes reduced to a sheath or a single bract; pedicels 3–12 mm. long; ovaries glabrous; fruit 7–10 mm. long, 3–6 mm. broad, glabrous, the oil tubes 1–4 in the intervals, 4–7 on the commissure.

TYPE: *Parish 1828*, Bear Valley (San Bernardino Mts.), California (NY, UC, US type coll.).

DISTRIBUTION: Western New Mexico to the San Bernardino Mts., California, southeastern Oregon to northern Sonora.

TYPICAL SPECIMENS: NEW MEXICO: Mangus Springs, *Rusby 148* (M, US). NEVADA: Mica Mine, *Jones 5072f* (Po, US). CALIFORNIA: n. side Old Baldy Mt., San Bernardino Co., *Parish 1942* (US); Pah Ute Peak, *Purpus 5288* (M, UC, US).

24b. Lomatium nevadense (Wats.) Coult. & Rose var. **pseudorientale** (Jones) Munz, Man. So. Calif. Bot. 360. 1935.

Cogswellia nevadensis (Wats.) Jones var. *pseudorientalis* Jones, Contr. Western Bot. 12: 33, 37. 1908.
Lomatium nevadense (Wats.) Coult. & Rose var. *holopterum* Jepson, Madroño 1: 156. 1924.

Similar to variety *Parishii*, the petioles more prominently scarious-margined; wings broader than the body, the dorsal ribs evident.

TYPE: *Jones*, Skull Valley, northwestern Arizona, 4300 feet, 1 May 1903 (Po).
DISTRIBUTION: Northwestern Arizona and adjacent Nevada and California.

SPECIMENS EXAMINED: NEVADA: Good Springs, *K. Brandegee* (UC). ARIZONA: Skull Valley, *Jones* (NY, Po, US); Prescott, *Harrison 4013* (US); Williams to Ash Fork, *Loomis 6929* (NY); Chloride, *Jones* (Po, NY); Hualapai Mts., *Jones* (Po); Grand Cañon, *Jones* (Po). CALIFORNIA: vic. of Bonanza King Mine, east slope of Providence Mts., Mojave Desert, *Munz, Johnston & Harwood 4236* (Po, US); Barnwell, *K. Brandegee* (Po, UC); Mojave, *Jones* (UC), *Purpus 7092a* (UC).

25. Lomatium Plummerae Coult. & Rose, Contr. U. S. Nat. Herb. 7: 232. 1900.

Peucedanum Plummerae Coult. & Rose, Bot. Gaz. 14: 278. 1889.
Cogswellia Plummerae (Coult. & Rose) Jones, Contr. Western Bot. 12: 34, 35. 1908.

Plants short-caulescent, 2–3.5 dm. tall, glabrous, from a long slender tap-root; leaves crowded near the base, oblong, the blades 5–10 cm. long, ternate, then bipinnate, the leaflets linear to oblong, 3–7 mm. long, 0.5–1 mm. broad, apiculate, the petioles 3–6 cm. long, entirely sheathing, scarious-margined; peduncles exceeding the leaves; umbels 10–25-rayed, the fruiting rays unequal, 0.5–7.5 cm. long, ascending; involucel bracts dimidiate, linear-lanceolate, acute, distinct or connate to above the middle, scarious at least on the margin, prominently nerved, entire or toothed, equalling to exceeding the yellow or purplish (white ?) flowers; umbellets many-flowered, the fruiting pedicels 3–8 mm. long; fruit oblong to oblong-ovate, 9–13 mm. long, 4–7 mm. broad, glabrous, usually acute at the apex, the wings narrower than the body, the oil tubes 1, rarely 2–3, in the intervals, 4–8 on the commissure.

TYPE: *Lemmon & Lemmon, 32* and *40*, Sierra Valley, Sierra Co., May 1889, and near Shasta, Shasta Co., 28 June 1889 (UC type coll.).

DISTRIBUTION: Northern Sierra Nevada from Sierra Co. to Shasta Co., California.

SPECIMENS EXAMINED: NEVADA: along road to Reno, *Sonne* (UC). CALIFORNIA: west of Verdi, Nevada, *Mathias 1207* (UC); Sierra Valley, *Lemmon s. n.* (UC); near Shasta, *Lemmon* (UC).

Lomatium Plummerae was originally described as having white flowers. It is very possible that this was an error easily made in a study from dried specimens. *Mathias 1207* is an excellent match for the type material of *L. Plummerae* but has yellow or purplish flowers.

25a. Lomatium Plummerae Coult. & Rose var. **Sonnei** (Coult. & Rose) Jepson, Madroño 1: 157. 1924.

Lomatium Sonnei Coult. & Rose, Contr. U. S. Nat. Herb. 7: 236. 1900.
Cogswellia Sonnei (Coult. & Rose) Jones, Contr. Western Bot. 12: 34. 1908.

Similar to the species but pubescent; the fruiting pedicels up to 10 mm. long; fruit glabrous.

TYPE: *Sonne*, sandy soil among sagebrush, Verdi, Washoe Co., Nevada, 5 May, 16 June 1895 (US).
DISTRIBUTION: Western Sierra Co., California, and adjacent Nevada.
SPECIMENS EXAMINED: NEVADA: along road to Reno, *Sonne* (UC); Verdi, Washoe Co., *Sonne* (UC type coll.); Reno, *Cowgill* (UC), *Jones* (Po), *Hillman* (Po), *Canby 24* (Po); Truckee Pass, Washoe Co., *Kennedy 1338* (M, UC); 2 mi. south of Virginia City, *Mathias 1269* (UC); 8 mi. n. e. of Reno, along Pyramid Lake Road, *Mathias 1223* (UC); 2 mi. east of Verdi, *Mathias 1215* (UC); about 10 mi. east of Glenbrook along Carson City Road, *Mathias 1271, 1272* (UC). CALIFORNIA: west of Verdi, Nevada, *Mathias 1208* (UC).

Jepson's interpretation of *L. Sonnei* as a variety of *L. Plummerae* is undoubtedly correct, since *Mathias 1207, L. Plummerae*, and *Mathias 1208*, variety *Sonnei*, were collected together near the type locality of the latter.

25b. Lomatium Plummerae Coult. & Rose var. **Austinae** (Coult. & Rose) Mathias, comb. nov.

Peucedanum Austinae Coult. & Rose, Bot. Gaz. 13: 208. 1888; Rev. N. Am. Umbell. 66. 1888.
Lomatium Austinae Coult. & Rose, Contr. U. S. Nat. Herb. 7: 236. 1900.
Cogswellia Austinae (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Similar to variety *Sonnei* in pubescence; fruit ovate, about 8 mm. long, about 5 mm. broad, not pointed at the apex.

TYPE: *Mrs. E. M. Austin*, Plumas Co., California, June 1880.
DISTRIBUTION: Known only from Plumas Co., California.
SPECIMENS EXAMINED: CALIFORNIA: Mohawk Valley, Plumas Co., *Lemmon 23*, s. n. (UC).

This plant has been distinguished by its purplish flowers. Specimens of *L. Plummerae* and its variety, *Sonnei*, frequently have purplish flowers, a character which is not apparent in herbarium material.

25c. Lomatium Plummerae Coult. & Rose var. **Helleri** Mathias, var. nov.

Planta 3.0–3.8 dm. alta cum 1–2-foliis caulinis, fructibus immaturis granulatis.

Plants 3–3.8 dm. tall, more caulescent than the species, with 1–2 stem leaves above, the primary leaf divisions more remote; sometimes scaberulent at the nodes; pedicels up to 10 mm. long; young fruit granulate-roughened.

TYPE: *Heller 10838*, near Marston Station, Plumas Co., California, 3500 feet, 13 June 1913 (UC 175513 TYPE, M).

DISTRIBUTION: Known only from the type collection.

26. Lomatium MacDougali Coult. & Rose, Contr. U. S. Nat. Herb. 7: 233. 1900.

Lomatium Jonesii Coult. & Rose, Contr. U. S. Nat. Herb. 7: 233. 1900.
Cogswellia MacDougali (Coult. & Rose) Jones, Contr. Western Bot. 12: 34. 1908.
C. Jonesii (Coult. & Rose) Jones, Contr. Western Bot. 12: 34. 1908.
Lomatium semisepultum Peck, Proc. Biol. Soc. Wash. 50: 122. 1937.

Plants acaulescent, 0.7–3 dm. tall, more or less villous throughout, from a long slender tap-root; leaves oblong-ovate, the blades 2–15 cm. long, ternate, then tripinnate, the leaflets crowded, linear to ovate, 1–5 mm. long, 0.5–1 mm. broad, apiculate, the petioles 1–2.5 cm. long, shorter than the leaf blades, mostly sheathing throughout, purplish; peduncles exceeding the leaves; umbels 2–14-rayed, the rays 0.5–6 cm. long, spreading; involucel bracts scarious, linear, usually distinct, villous; umbellets about 20-flowered, the flowers yellow, somewhat purplish-tinged, the fruiting pedicels 3–10 mm. long; fruit ovate to suborbicular, 6–11 mm. long, 4–7 mm. broad, pubescent, the wings narrower than the body, the oil tubes 1–4 in the intervals, 4–6 on the commissure.

TYPE: *Jones 5435*, Irelands Ranch, head of Salina Canyon, Utah, alt. 2400 m., 15 June 1894 (US).

DISTRIBUTION: Great Basin, from western Wyoming to central Oregon, south to central Arizona.

TYPICAL SPECIMENS: WYOMING: Ft. Steele, *Nelson 4835* (NY, US); Cooper Lake, Albany Co., *Goodding 13* (M, NY, Po, US). UTAH: Frisco, *Jones 1689* (NY, US). ARIZONA: Mormon Lake, *MacDougal 84* (NY, UC, US type of *L. MacDougali*); Walnut Canyon, *Purpus 20* (M, UC, US).

27. Lomatium juniperinum (Jones) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 235. 1900.

Peucedanum juniperinum Jones, Contr. Western Bot. **8**: 29. 1898.
Cogswellia juniperina Jones, Contr. Western Bot. **12**: 34. 1908.

Plants acaulescent or short-caulescent, 1.2–2.2 dm. tall, puberulent, from a long slender tap-root; stems purplish below; leaves broadly ovate, the blades 3–6 cm. long, 1–2-ternate or quinate, then 2–3-pinnate, the leaflets crowded, filiform to linear, 1–4 mm. long, 0.5–1 mm. broad, entire, apiculate, the petioles 1.5–3 cm. long, entirely sheathing; peduncles exceeding the leaves; umbels 8–20-rayed, the fruiting rays 3–8, unequal, 1–5 cm. long, ascending; involucel bracts filiform-subulate, scarious, about equalling the yellow flowers; umbellets many-flowered, the fruiting pedicels 5–10 mm. long; ovaries and fruit glabrous, the fruit oblong, 5–8 mm. long, 3–4 mm. broad, the wings about half the width of the body, the oil tubes 2–3 in the intervals, 4 on the commissure.

TYPE: *Jones*, among junipers, Coalville, Utah, 14 May 1889 (Po).
DISTRIBUTION: Northern Utah, adjacent Idaho, and Wyoming.
TYPICAL SPECIMENS: WYOMING: Evanston, *Nelson 3016* (M); Carter, *Jones* (Po).

28. Lomatium foeniculaceum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 222. 1900.

? Ferula pubescens Nutt. in Fraser's Cat. 1813, nom. nud.
F. foeniculacea Nutt. Gen. Am. **1**: 183. 1818.
Lomatium villosum Raf. Journ. Phys. **89**: 101. 1819.
Cogswellia villosa (Raf.) Spreng. ex Linn. Syst. Veg. ed. Roem. & Schult. **6**: XLVIII. 1820.
Pastinaca foeniculacea (Nutt.) Spreng. ex Linn. Syst. Veg. ed. Roem. & Schult. **6**: 587. 1820.
Lomatium pubescens Raf. ex Seringe, Bull. Bot. **1**: 216. 1830.
L. athamantoides Raf. The Good Book **1**: 55. 1840.
Peucedanum foeniculaceum Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 627. 1840.
P. foeniculaceum Nutt. var. *daucifolium* Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 627. 1840, as to specimens from Saskatchewan.
Pastinaca ferulacea Walp. Rep. **2**: 412. 1844–45, nom. nud. in synon.
Peucedanum villosum (Raf.) Nutt. ex Wats. Bot. King Exp. 131. 1871.
Cogswellia villosa (Raf.) Jones, Contr. Western Bot. **12**: 34. 1908.
C. foeniculacea (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 449. 1909.

Plants acaulescent, 1–5 dm. tall, villous to glabrate, from a long, more or less thickened tap-root; leaves ovate to oblong, the blades 4.5–13 cm. long, 3–4-pinnate, the leaflets crowded, linear, 2–4 mm. long, about 0.5–1 mm. broad apiculate, the petioles 3–8 cm. long, sheathing about to the middle, the sheath purplish, subscarious; peduncles exceeding the leaves; umbels 8–24-rayed, the rays subequal, 0.7–12.5 cm. long, spreading to erect; involucel bracts dimidiate, lanceolate, connate below, entire or lobed, acute to acuminate, somewhat scarious-margined, about equalling the yellow flowers; umbellets 25–50-flowered, the fruiting pedicels 2–13 mm. long; fruit ovate-oblong, 7–10 mm. long, 4–6 mm. broad, more or less pubescent, the wings narrower than the body, the oil tubes 3 in the intervals, 4 on the commissure.

TYPE: *Nuttall*, "on the high plains of the Missouri, commencing about the confluence of the river Jauke." (Probably the James (Jacques) River in South Dakota.)

DISTRIBUTION: Manitoba to northern Oklahoma, western Missouri to western Montana and Wyoming.

TYPICAL SPECIMENS: SOUTH DAKOTA: Newell, *Carr 1* (M, NY, US); Fort Meade, *Forwood 145* (M, US). WYOMING: 45 miles n. of Point of Rocks, *Merrill & Wilcox B 571* (NY, US); Ft. Steele, *Nelson 4835* (M).

29. Lomatium daucifolium (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 221. 1900.

Peucedanum foeniculaceum Nutt. var. *daucifolium* Nutt. ex Torr. & Gray, Fl. N. Am. 1: 627. 1840, in part.

P. daucifolium Nutt. ex Torr. & Gray, Fl. N. Am. 1: 627. 1840, nom. nud. in synon.

P. villosum Nutt. ex Wats. Bot. King Exped. 131. 1871, in part.

Cogswellia daucifolia (Nutt.) Jones, Contr. Western Bot. **12**: 34. 1908.

Peucedanum foeniculaceum of many later authors, not Nutt. (1840).

Plants acaulescent, 1–4.5 dm. tall, villous-tomentose to glabrate, from a long, more or less swollen tap-root; leaves broadly ovate to obovate, the blades 5–19 cm. long, ternate, then 3–4-pinnate, the leaflets linear, 2–8 mm. long, about 0.5 mm. broad, more or less crowded, entire, apiculate, the petioles 3–13 cm. long, purplish, sheathing below; peduncles exceeding the leaves; umbels 12–30-rayed, the rays subequal, 1.5–7 cm. long, erect to speading; involucel bracts subdimidiate,

lanceolate, acute to acuminate, subscarious, conspicuously nerved, connate to above the middle, equalling the yellow flowers; umbellets 20–40-flowered, the fruiting pedicels 4–13 mm. long, the ovaries glabrous; fruit ovate-oblong, 6–9 mm. long, 3–6 mm. broad, glabrous, the wings narrower than the body, the oil tubes 1–3 in the intervals, 2–4 on the commissure, occasionally solitary near the base of each wing.

TYPE: *Nuttall*, on the Platte, probably in Nebraska (NY, Ph).

DISTRIBUTION: Southern South Dakota to Texas.

TYPICAL SPECIMENS: MISSOURI: Independence, Jackson Co., *Bush 322* (M, NY, US). KANSAS: Riley Co., *Norton 190, 190a* (M, NY, US). OKLAHOMA: near Cora, Woods Co., *Stevens 221* (M, US); Norman, *Gould* (M).

30. Lomatium orientale Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 220. 1900.

Peucedanum nudicaule Nutt. ex Torr. & Gray, Fl. N. Am. 1: 627. 1840, in large part, and of all later authors.

P. orientale (Coult. & Rose) Blankinship, Mont. Agric. Coll. Sci. Studies, Bot. 1: 93. 1905.

Cogswellia orientalis (Coult. & Rose) Jones, Contr. Western Bot. **12**: 33. 1908.

Plants short-caulescent, 1–4 dm. tall, soft-puberulent, from a long slender tap-root; leaves ovate to oblong, the blades 4–11 cm. long, tripinnate, the leaflets crowded, the uppermost confluent, linear, 1–12 mm. long, 0.5–2 mm. broad, apiculate, the petioles 2–12 cm. long, sheathing below, petioles of cauline leaves entirely sheathing; fruiting peduncles exceeding the leaves; umbels 6–21-rayed, the rays 1.2–5.5 cm. long, subequal; involucel bracts linear-lanceolate to more or less obovate, distinct, scarious-margined, about equalling the white flowers; umbellets about 20-flowered, the fruiting pedicels 3–9 mm. long, glabrous; fruit ovate-oblong, 5–10 mm. long, 3–7 mm. broad, glabrous, the wings narrower than the body, the oil tubes 1–4 in the intervals, 2–8 on the commissure, rarely 1–2 near the base of the wings.

TYPE: *Bethel*, plains around Denver, Colorado, May 1895 (US).

DISTRIBUTION: Western Minnesota to Kansas, west to Montana and Colorado.

TYPICAL SPECIMENS: NORTH DAKOTA: Leeds, *Lunell* (M, NY). WYOMING: sandy valleys and slopes, Sand Creek, Albany Co., *Nelson 7013* (M, NY, Po). COLORADO: Loveland, *Nelson 10754* (M, NY); Larimer Co., *Baker 203* (M).

31. Lomatium dasycarpum (Torr. & Gray) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 218. 1900.

Peucedanum dasycarpum Torr. & Gray, Fl. N. Am. 1: 628. 1840.
P. foeniculaceum Torr. Bot. Mex. Bound. Surv. 70. 1859, not Nutt. (1840).
P. Pringlei Coult. & Rose, Bot. Gaz. 13: 209. 1888.
P. Jaredi Eastw. Zoe 5: 88. 1900.
Cogswellia Jaredi (Eastw.) Coult. & Rose, Contr. U. S. Nat. Herb. 12: 450. 1909.
C. dasycarpa (Torr. & Gray) Jones, Contr. Western Bot. 12: 34. 1908.
Lomatium dasycarpum (Torr. & Gray) Coult. & Rose var. *decorum* Jepson, Madroño 1: 154. 1924.
L. dasycarpum (Torr. & Gray) Coult. & Rose var. *medium* Jepson, Madroño 1: 154. 1924.

Plants acaulescent or short-caulescent, 1–4 dm. tall, villous-tomentose to glabrate, purplish, especially below, from a long slender tap-root; leaves oblong to ovate, the blades 3–13.5 cm. long, quadripinnate, occasionally ternate, then pinnately decompound, the leaflets crowded, not confluent, linear, 1–3 mm. long, about 0.5 mm. broad, entire, obtuse to acute, the petioles 2.5–10 cm. long, sheathing to near the middle; peduncles exceeding the leaves; umbels 10–20-rayed, the fruiting rays spreading, 1–8.5 cm. long; involucel bracts linear-lanceolate, acute, sometimes connate, about equalling the greenish flowers (appearing white because of the pubescent petals); umbellets many-flowered, the fruiting pedicels 7–20 mm. long, mostly longer than the fruit; fruit orbicular to ovate-oblong, 8–15 mm. long, 7–10 mm. broad, the wings wider than the body, sparingly villous to glabrate, the body tomentulose to glabrate, the oil tubes 1–4 in the intervals, occasionally with smaller accessory oil tubes, 2–4 on the commissure, rarely one at the base of each wing.

TYPE: *Douglas*, California.

DISTRIBUTION: Coast ranges, Lower California to Humboldt and Trinity counties, California.

TYPICAL SPECIMENS: CALIFORNIA: Potrero and Sausalito, *Kellogg & Harford 1156* (M, NY, US); hills 7 miles northeast of Santa Rosa, Sonoma Co., *Heller & Brown 5088a* (M, NY, Po, US); Klamath River, Humboldt Co., *Chandler 1445* (M, NY, UC, US).

32. Lomatium mohavense Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 234. 1900.

Peucedanum mohavense Coult. & Rose, Rev. N. Am. Umbell. 62. 1888.
P. argense Jones, Contr. Western Bot. **8**: 30. 1898.
Lomatium argense (Jones) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 234. 1900.
Cogswellia mohavensis (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34. 1908.
C. argensis (Jones) Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 449. 1909.

Plants acaulescent, 1–3 dm. tall, short hoary-pubescent, from a long slender tap-root; leaves oblong, the blades 2–9 cm. long, 3–4-pinnate, the leaflets crowded, linear, 2–5 mm. long, 0.5–1.5 mm. broad, mucronulate, the petioles 2.5–12 cm. long, longer than the leaf blades, shortly sheathing below; peduncles exceeding the leaves; umbels 10–16-rayed, the fruiting rays subequal, 1–4.5 cm. long; involucel bracts linear, acute, sometimes inconspicuously scarious-margined, shorter than to about equalling the fruiting pedicels; umbellets many-flowered, the flowers purple, the fruiting pedicels 1–10 mm. long; fruit ovate to orbicular, 4.5–9 mm. long, 4–9 mm. broad, the wings narrower than to equalling the body, the oil tubes 1–4 in the intervals, 4–6 on the commissure.

TYPE: *M. K. Curran*, Yucca, Mojave Desert, California (US fragment).
DISTRIBUTION: Deserts, southern California and adjacent Nevada, especially in the Mojave Desert.
TYPICAL SPECIMENS: NEVADA: Trail Canyon, White Mts., Esmeralda Co., *Duran 2701* (M, UC). CALIFORNIA: Walker Pass, *Purpus 5552* (M, UC, US); Darwin, *Jones* (M, NY, UC, US); Mojave Desert, near Hesperia, *Parish 4929* (US).

33. Lomatium tomentosum (Benth.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 219. 1900.

Peucedanum tomentosum Benth. Pl. Hartw. 312. 1849.
Cogswellia tomentosa (Benth.) Jones, Contr. Western Bot. **12**: 35. 1908.

Plants short-caulescent, villous-tomentose throughout, 2.5–5 dm. tall, from a long slender tap-root; leaves oblong to obovate, the blades 5–11 cm. long, pinnately decompound or ternate, then quadripinnate, the leaflets crowded, filiform, 2–6 mm. long, 0.2–0.3 mm. broad, acute, sometimes apiculate, the petioles 4–9 cm. long, sheathing below; peduncles exceeding the leaves;

umbels 12–21-rayed, the fruiting rays subequal, 2.5–8.5 cm. long, spreading; involucel bracts lanceolate to ovate-lanceolate, distinct or connate below, acute to acuminate, entire or cleft above, equalling to exceeding the white or purplish flowers; umbellets many-flowered, the fruiting pedicels 5–20 mm. long, shorter than the mature fruit; fruit ovate-oblong, 16–22 mm. long, 8–18 mm. broad, tomentulose, the wings about equalling the body, tomentulose, the oil tubes 1–3 in the intervals, 3 on the commissure, usually 1 at the base of each wing.

TYPE: *Hartweg 257 (1751)*, "in amnibus exsiccatis fluviorum vallis, Sacramento," California, 1846–47.

DISTRIBUTION: Great Valley and Sierra Nevada foothills, and Tehachapi Mts., California.

TYPICAL SPECIMENS: CALIFORNIA: Wildcat Canyon, Stanislaus Co., *Stanford 860* (M, Po, US); Berry Canyon, near Clear Creek, Butte Co., *Heller & Brown 5558* (M, NY, Po, US); hills 8 miles north of Oroville, Butte Co., *Heller 11281* (M, NY, US).

34. Lomatium macrocarpum (Hook. & Arn.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 217. 1900, where the author of the name-bearing synonym is erroneously given as Nuttall.

Ferula macrocarpa Hook. & Arn. Bot. Beechey Voy. 348. 1840.
Peucedanum macrocarpum Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 627. 1840.
P. macrocarpum Nutt. var. *? eurycarpum* Gray, Proc. Am. Acad. **8**: 385. 1872.
P. eurycarpum (Gray) Coult. & Rose, Rev. N. Am. Umbell. 61. 1888.
Lomatium macrocarpum (Nutt.) Coult. & Rose var. *artemisiarum* Piper, Bull. Torrey Bot. Club **29**: 223. 1902.
L. macrocarpum (Nutt.) Coult. & Rose var. *semivittatum* Piper, Bull. Torrey Bot. Club **29**: 224. 1902.
L. flavum Suksd. Allg. Bot. Zeitschr. **12**: 6. 1906.
L. artemisiarum Piper, Contr. U. S. Nat. Herb. **11**: 423. 1906.
Cogswellia macrocarpa (Nutt.) Jones, Contr. Western Bot. **12**: 33. 1908.
C. artemisiarum (Piper) Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 449. 1909.
C. flava (Suksd.) Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 449. 1909.
C. simulans Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 451. 1909.
Lomatium macrocarpum (Nutt.) Coult. & Rose var. *Douglasii* Jepson, Madroño **1**: 153. 1924.
Cogswellia macrocarpa (Nutt.) Jones var. *artemisiarum* (Piper) St. John, Fl. S.E. Wash. & Adj. Ida. 292. 1937.

Plants short-caulescent, 1–5 dm. tall, densely tomentose to villous, becoming glabrate, purplish especially below, from a slender or somewhat swollen tap-root; leaves oblong to ob-

ovate, the blades 2.5–12 cm. long, ternate, then 2–3-pinnate, the leaflets confluent, oblong to linear, 1–7 mm. long, 0.5–2 mm. broad, entire, mucronulate, the petioles 1.5–7 cm. long, sheathing about to the middle, subscarious; peduncles exceeding the leaves; umbels 5–25-rayed, the rays spreading, 1–8.5 cm. long; involucel bracts dimidiate, linear-lanceolate, acute, equalling to greatly exceeding the white or yellow, sometimes purplish, flowers, becoming reflexed in the mature plant; umbellets many-flowered, the fruiting pedicels 1–14 mm. long, spreading; fruit narrowly oblong, 9–20 mm. long, 2–8 mm. broad; ovaries and young fruit glabrous to villous, the mature fruit glabrous or glabrate, the wings narrower than the body, the oil tubes 1, rarely 2–3, in the dorsal intervals, 1–3 in the lateral intervals, sometimes obscure, 2–6 on the commissure.

TYPE: *Douglas*, California.

DISTRIBUTION: Manitoba to North Dakota, west to British Columbia, south to Kern and Monterey counties, California.

TYPICAL SPECIMENS: YELLOWSTONE NATIONAL PARK: Yellowstone River, near Junction Butte, *Nelson & Nelson 5733* (M, NY, Po, US). WYOMING: 20 miles west of Big Piney, Sublette Co., *Payson & Payson 2633* (M, NY, Po, US). UTAH: Springville, *Jones* (M, NY, US). NEVADA: Palisade, *Jones 3883* (M, NY, Po, US). WASHINGTON: Pullman, *Elmer 96* (M, NY, US); Hangman Creek, Spokane Co., *Sandberg & Leiberg 61* (M, NY, Po, US). CALIFORNIA: near Lakeport, Lake Co., *Baker 2961* (M, NY, Po, US); near summit of Mt. Sanhedrin, Lake Co., *Heller & Brown 5947* (M, US).

This species is the most ubiquitous and most polymorphic in the genus.

34a. Lomatium macrocarpum (Hook. & Arn.) Coult. & Rose var. **ellipticum** (Torr. & Gray) Jepson, Madroño **1**: 153. 1924.

Peucedanum nudicaule Nutt. var. *ellipticum* Torr. & Gray, Pacific R.R. Rep. **2**[3]: 121. 1855.

Lomatium ellipticum (Torr. & Gray) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 217. 1900.

Cogswellia elliptica (Torr. & Gray) Jones, Contr. Western Bot. **12**: 33. 1908.

Similar to the species but the pedicels sometimes longer, up to 16 mm. long; the fruit oblong-elliptic, 16–18 mm. long, 6–10 mm. broad, glabrous, the wings twice as broad as the body.

TYPE: *Snyder*, Round Valley, near the sources of the Sacramento, in the Sierra Nevada, California, 27 June 1854.

DISTRIBUTION: Northern Sierra Nevada, California.
SPECIMENS EXAMINED: CALIFORNIA: near Placerville, *K. Brandegee* (UC).

35. Lomatium Congdoni Coult. & Rose, Contr. U. S. Nat. Herb. 7: 232. 1900.

Cogswellia Congdoni (Coult. & Rose) Jones, Contr. Western Bot. 12: 34. 1908.

Plants acaulescent or short-caulescent (?), 1.8–3.6 dm. tall, from a cluster of old leaf sheaths, from a long tap-root; leaves broadly oblong, the blades 6.5–9 cm. long, ternate to quinate, then 2–3-pinnate, the rachises scaberulent, the leaflets distinct, linear, 3–10 mm. long, about 0.5 mm. broad, apiculate, the petiole 2–6 cm. long, entirely sheathing, white-scarious; peduncles exceeding the leaves, purplish, especially below; umbels 6–16-rayed, the fruiting rays 3–7 cm. long, ascending; involucel absent; umbellets about 30-flowered, the flowers yellow, the fruiting pedicels 6–10 mm. long; fruit oblong or somewhat obovate, 7–10 mm. long, 5–6 mm. broad, the wings about half the width of the body, the oil tubes obscure, mostly solitary in the intervals, 2–4 on the commissure.

TYPE: *Congdon 114*, West Water Ditch, Mariposa Co., California, 12, 25 May 1893 (US).
DISTRIBUTION: Known only from the type locality.
SPECIMENS EXAMINED: CALIFORNIA: Mariposa, *Congdon* (UC); West Water Ditch, Mariposa Co., *Congdon* (UC).

36. Lomatium Sandbergii Coult. & Rose, Contr. U. S. Nat. Herb. 7: 230. 1900.

Peucedanum Sandbergii Coult. & Rose, Bot. Gaz. 13: 79. 1888; Rev. N. Am. Umbell. 65. 1888.
Cogswellia Sandbergii (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Plants caulescent, 0.7–3 dm. tall, rough-puberulent to glabrate, from a long slender tap-root; leaves suborbicular, the blades 3–7 cm. long, ternate, then tripinnate, the leaflets linear to filiform, 2–4 mm. long, about 0.5 mm. broad, entire, apiculate, the petioles 1–2.5 cm. long, entirely sheathing, the sheaths with a conspicuous white scarious margin; peduncles 1.5–15 cm. long; umbels 5–14-rayed, the fruiting rays unequal, 1–11.5 cm. long, erect; umbellets many-flowered, the fruiting pedicels 2–7

mm. long; involucel bracts filiform to linear, about equalling the yellow flowers; fruit oblong, 7–10 mm. long, 4–5 mm. broad, puberulent, the wings narrower than the body, the oil tubes 4–5 in the intervals, 6 on the commissure.

TYPE: *Sandberg 47*, "bare mountain tops along snowdrifts, Kootenai County, northern Idaho," July 1887 (US type coll.).

DISTRIBUTION: Western Montana and adjacent Idaho.

SPECIMENS EXAMINED: MONTANA: Columbia Falls, *Williams s. n.* (M, Po), *969* (M); McDougal Peak, *Jones s.n., 8620* (Po). IDAHO: Kootenai Co., *Sandberg* (M photo); Div. between St. Joe and Clearwater River, *Leiberg 1235* (M); open mountain slopes, ridges south from Wiesner's Peak, *Leiberg 1401* (M).

37. Lomatium Torreyi Coult. & Rose, Contr. U. S. Nat. Herb. 7: 229. 1900.

Peucedanum Torreyi Coult. & Rose, Bot. Gaz. 14: 276. 1889.
Cogswellia Torreyi (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Plants acaulescent or caulescent, 1–2.5 dm. tall, glabrous to sparingly scaberulent, from a cluster of dried leaf sheaths; leaves oblong, the blades 2–15 cm. long, ternate, then tripinnate, the leaflets filiform, 3–8 mm. long, 0.2–1 mm. broad, entire, acute, mucronulate, the petioles 2–5 cm. long, sheathing throughout, the sheath with a white scarious margin; peduncles equalling or exceeding the leaves; umbels 5–9-rayed, the fruiting rays unequal, 1–4 cm. long, erect; involucels absent; umbellets 10–30-flowered, the flowers yellow, the fruiting pedicels 1–4 mm. long; fruit narrowly oblong, 10–16 mm. long, 3–4 mm. broad, narrowed toward the base, the wings less than one-half the width of the body, the oil tubes solitary in the intervals.

TYPE: *Torrey & Gray*, Yosemite Valley, California, is the first specimen cited in the original description. *M. K. Curran 16*, Yosemite Valley, June 1883, is given as the type in Contr. U. S. Nat. Herb. 7: 230. Described without name in Bot. Calif. 1: 263, as a plant closely allied to *Podosciadium*.

DISTRIBUTION: Clefts of granite rocks, Sierra Nevada Mts., from Fresno Co. to Tulare Co., California, 6000 to 11,000 feet.

SPECIMENS EXAMINED: CALIFORNIA: Mt. Moses, *Purpus 1531* (UC); Sentinel Dome, Yosemite National Park, *Schreiber 1720* (UC); Alta Meadows, Tulare Co., *K. Brandegee* (M, UC); Rock Creek Basin, Inyo Co., slope west of Long Lake, *Peirson 10771* (UC); road to Alta Meadows, *K. Brandegee* (UC); granite lakes, Granite Basin, Fresno Co., *Youngberg 155* (Po); Piute Pass, North Lake Trail, Inyo Co., *Ferris 8926* (Po).

38. Lomatium Engelmannii Mathias, spec. nov.

Planta acaulis, 1–3 dm. alta, pubescens; radicibus elongatis; foliis oblongis, petiolis excludentibus, 2.5–3.5 cm. longis, ternatis, deinde 1–2-pinnatis, foliolis confluentibus, ovato-oblongis, 1–4 mm. longis, 0.5–1 mm. latis, apiculatis, petiolis 2–4 cm. longis; pedunculis foliis longioribus; umbellis 2–7-radiatis, radiis inaequalibus, 1–5.5 cm. longis; umbellulis paucifloribus, sine involucellis, pedicellis 2–8 mm. longis; fructibus ovato-oblongis, 9–10 mm. longis, ca. 5 mm. latis, glabris, alis lateralibus angustis, jugis dorsalibus filiformibus, vittis 1–2 in intervallis, 2–6 in commissura.

Plants acaulescent, 1–3 dm. tall, pubescent, from a long slender tap-root; leaves oblong, the blades 2.5–3.5 cm. long, ternate, then 1–2-pinnate, the leaflets confluent, ovate-oblong, 1–4 mm. long, 0.5–1 mm. broad, apiculate, the petioles 2–4 cm. long, entirely sheathing, purplish; peduncles exceeding the leaves; umbels 2–7-rayed, the fruiting rays 1–4, unequal, 1–5.5 cm. long; involucel bracts absent; umbellets few-flowered, the flowers yellow (?), the fruiting pedicels 2–8 mm. long; fruit ovate-oblong, 9–10 mm. long, about 5 mm. broad, glabrous, the wings half the width of the body, the dorsal ribs filiform, the oil tubes 1–2 in the intervals, 2–6 on the commissure.

TYPE: *George Engelmann*, Scott's Mountain (Siskiyou Co.), northern California, 6000–7000 feet, 30 August 1880 (M 137292 TYPE, 137293).

DISTRIBUTION: Known only from the high mountains in southern Siskiyou Co., California.

SPECIMENS EXAMINED: CALIFORNIA: gravelly slope of Mt. Eddy, south of Wagon Creek, Siskiyou Co., *Heller 13676* (M).

39. Lomatium angustatum (Coult. & Rose) St. John, in St. John & Hardin, Mazama **11**: 83. 1929.

Peucedanum Martindalei Coult. & Rose var. *angustatum* Coult. & Rose, Bot. Gaz. **13**: 143. 1888.

Lomatium Martindalei Coult. & Rose var. *angustatum* Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 225. 1900.

Cogswellia Martindalei (Coult. & Rose) Jones var. *angustata* (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34. 1908.

C. angustata Coult. & Rose, Contr. U. S. Herb. **12**: 449. 1909.

Lomatium Hallii of authors, not *Peucedanum Hallii* Wats. (1876).

Plants short-caulescent, 1.5–2 dm. tall, glabrous, from long slender tap-roots; leaves broadly oblong-ovate, the blades 6.5–15 cm. long, ternate, then 2–3-pinnate, the leaflets confluent and overlapping, ovate, 1–2 mm. long, 1–1.5 mm. broad, somewhat obtuse, minutely mucronulate, the petioles 1.5–3 cm. long, forming a conspicuous scarious sheath; peduncles exceeding the leaves; umbels 6–16-rayed, the rays unequal, 0.5–7 cm. long; involucels absent; umbellets about 20-flowered, the flowers creamy-white, the fruiting pedicels 1–6 mm. long; fruit narrowly oblong, 6–10 mm. long, 3–5 mm. broad, the wings very narrow, the oil tubes 1, rarely 2, in the intervals, 2–4 on the commissure.

TYPE: *Howell*, Cascade Mts., Oregon.

DISTRIBUTION: Mountains of western British Columbia to the Cascade Mts., Oregon, 3000 to 9000 feet.

TYPICAL SPECIMENS: WASHINGTON: Mt. Hermann, Whatcom Co., *Thompson 5319* (M, Th). OREGON: north slope, top of Black Butte, *Cusick 2687* (M, Po, UC); near summit of Cascade Mts. along McKenzie Pass, *Peck 9782* (M).

Lomatium angustatum differs from *L. Martindalei*, with which it has been confused, in having ternate-pinnate leaves, the fruit wings narrower than the body, the fruit less than 6 mm. broad, the pedicels shorter than the fruit (except in var. *flava* in the Olympic Mts.), and a narrowly oblong fruit. *Lomatium Martindalei* does not occur north of the Oregon Cascades. Neither of these species has any close relationship to *L. Hallii* (see note under that species), as has been supposed by all previous authors due to a misinterpretation and confusion in the type specimen of *L. Hallii*.

39a. Lomatium angustatum (Coult. & Rose) St. John var. **flavum** G. N. Jones, Univ. Wash. Publ. Biol. 5: 202. 1936.

Similar to the species but the leaves sometimes fleshier, flowers lemon-yellow, pedicels 8–16 mm. long.

TYPE: *Piper 897*, Olympic Mts., Washington.

DISTRIBUTION: Olympic Mts., Washington, 4500–6500 feet.

SPECIMENS EXAMINED: WASHINGTON: Iron Mt., near Marmot Pass, Jefferson Co., *Thompson 7958* (Th); bordering Honeymoon Meadows along west fork of the Dosewallips River and south base of Mt. Anderson, *Meyer 666* (Th); rocky crest of Constance Ridge, Jefferson Co., *Thompson 6590* (Th); rocky summit of Mt. Angeles, Clallam Co., *Thompson 5591* (M, Th); Clallam Co., *Elmer 2771* (M); al-

pine slopes of Mt. Angeles, Clallam Co., *Thompson 7464, 9445* (M, Po, Th, UC); rocky crevices at summit of Col. Bob Lookout, Grays Harbor Co., *Thompson 7859* (M, Th, UC).

40. Lomatium Grayi Coult. & Rose, Contr. U. S. Nat. Herb. 7: 229. 1900.

Peucedanum millefolium Wats. Bot. King Exp. 129. 1871, not Sonder (1861-62).

P. Grayi Coult. & Rose, Bot. Gaz. 13: 209. 1888; Rev. N. Am. Umbell. 60. 1888.

P. Grayi Coult. & Rose var. *aberrans* Jones, Contr. Western Bot. 10: 55. 1902.

Cogswellia millefolia (Wats.) Jones, Contr. Western Bot. 12: 35. 1908.

C. Grayi Coult. & Rose, Contr. U. S. Nat. Herb. 12: 450. 1909.

Lomatium millefolium (Wats.) Macbr. Contr. Gray Herb. n.s. 53: 15. 1918.

Plants acaulescent or short-caulescent, 2–6.1 dm. tall, from a long thickened tap-root; leaves broadly obovate, the blades 10.5–26 cm. long, glabrous to somewhat scaberulent, 1–2-ternate or quinate, then 2–3-pinnate, the leaflets crowded, linear to filiform, 1–11 mm. long, 0.1–0.25 mm. broad, entire, mucronulate, the petioles 3.5–22 cm. long, sheathing at the base; peduncles exceeding the leaves; umbels 7–22-rayed, the rays spreading, 2–15 cm. long; involucel bracts filiform, entire, occasionally toothed, usually shorter than the yellow flowers, rarely deciduous; umbellets 15–30-flowered, the fruiting pedicels 6–22 mm. long; fruit ovate-oblong to oblong, 7–16 mm. long, 5–8 mm. broad, the wings narrower than to equalling the body, the oil tubes solitary in the intervals, rarely 2–3, especially in the lateral intervals, 2–4, rarely 6, on the commissure.

TYPE: *Watson 466*, Antelope Island, Salt Lake, Utah (US).

DISTRIBUTION: Western Wyoming and Colorado to eastern Washington and Oregon, 750 to 8400 feet.

TYPICAL SPECIMENS: IDAHO: about Lewiston, Nez Perce Co., *Heller & Heller 3043* (M, NY, Po). UTAH: gravel, Fairview, *Jones 5548* (M, NY, Po). WASHINGTON: Hangman Creek, Spokane Co., *Sandberg & Leiberg 5* (M, Po); shores of Snake River, Wawawai, *Piper 1767* (NY).

40a. Lomatium Grayi Coult. & Rose var. **depauperatum** (Jones) Mathias, comb. nov.

Cogswellia millefolia (Wats.) Jones var. *depauperata* Jones, Contr. Western Bot. 12: 38. 1908.

Similar to the species but usually lower; leaves dissected into few remote small linear pinnae.

TYPE: *Jones*, Dugway, Utah, 2 June 1891 (Po 78055).

DISTRIBUTION: Western Utah and adjacent Nevada.

SPECIMENS EXAMINED: UTAH: Dugway, Dutch Mt., Tooele Co., Cove Creek, Detroit, Granite Mts., Tooele Co., Fish Spring, Oquirrh Mts., Deseret, *Jones* (Po); Marjim Canyon, 46 mi. w. of Delta, Millard Co., *Maguire & Becraft 3938* (UC). NEVADA: west of Wendover, *Jones 25253* (Po); Pilot Mt., White Pine Co., *Cottam 4533* (Po); *A. J. Jones* (M).

41. Lomatium serpentinum (Jones) Mathias, comb. nov.

Cogswellia serpentina Jones, Contr. Western Bot. **12**: 42. 1908.
C. fragrans St. John, Fl. S.E. Wash. & Adj. Ida. 290. 1937.

Plants acaulescent, 2.5–3 dm. tall, essentially glabrous, root thick and woody with a multicipital caudex; leaves oblong, the blade 8.5–15 (30?) cm. long, 1–2-ternate, then bipinnate, the leaflets crowded, lanceolate to oblanceolate, 2–5 mm. long, 1–2 mm. broad, entire, apiculate, minutely papillose above, the petioles 2–6 cm. long, partially to entirely sheathing with scarious-winged margins; peduncles exceeding the leaves; umbels 10–17-rayed, the fruiting rays unequal, 1.5–7 cm. long, spreading to ascending, glabrate; involucel bracts linear-lanceolate, up to 5 mm. long, finely puberulent; umbellets many-flowered, the flowers bright yellow, the fruiting pedicels 3–15 mm. long; fruit oblong, 6–8 (10?) mm. long, 3–4 (5?) mm. broad, glabrous, the wings one-half to equalling the width of the body, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Cusick 3532c*, rocky banks of the Snake River near the mouth of McDougal Creek, Oregon, 28 May 1901.

DISTRIBUTION: Snake River Valley, Idaho, Washington, and Oregon.

SPECIMENS EXAMINED: IDAHO: clefts in basaltic cliffs, above Steep Creek, 2 mi. n. of Sheep Creek, Snake River Canyon, Idaho Co., *Constance, Rollins & Dillon 1591* (Th, UC); basaltic ledges of Cottonwood Rapids, Snake River Canyon, Nez Perce Co., *Constance, Rollins & Dillon 1559* (UC); basalt ledges, rocky south slopes ½ mi. above mouth of Sheep Creek, Snake River Canyon, Idaho Co., *Constance, Herrick & Peters 1829* (UC).

Reported by St. John from Asotin Co., Washington.

42. Lomatium Donnellii Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 231. 1900.

Peucedanum Donnellii Coult. & Rose, Bot. Gaz. **13**: 143. 1888; Rev. N. Am. Umbell. 65. 1888.
Cogswellia Donnellii (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34. 1908.

Plants acaulescent or caulescent with the development of a pseudoscape, 1.3–3.3 dm. tall, glabrous, from a long, some-

what stout tap-root; leaves ovate to oblong, the blades 4–10.5 cm. long, ternate then 2–3-pinnate, the leaflets more or less confluent, linear, 1–7 mm. long, 1–2 mm. broad, entire, acute, apiculate; the petioles 1–9 cm. long, sheathing below, sometimes entirely sheathing; peduncles exceeding the leaves; umbels 8–30-rayed, the fruiting rays unequal, 1–9 cm. long, spreading to suberect; involucel bracts filiform to linear-lanceolate, equalling the yellow flowers; umbellets about 20-flowered, the fruiting pedicels 3–15 mm. long; fruit ovate to ovate-oblong, 5–9 mm. long, 4–5 mm. broad, the wings less than half the width of the body, the oil tubes 3–6 in the intervals, 4–6 on the commissure.

TYPE: *Cusick 36*, Union Co., Oregon, May 1883, is the first specimen cited; *Howell 829* is given as the type in Contr. U. S. Nat. Herb. 7: 231.

DISTRIBUTION: Eastern Oregon.

SPECIMENS EXAMINED: OREGON: *Cusick 1587* (M, Po, UC); Prairie City, Grant Co., *Henderson 5183, 5185* (M); Fossil, Wheeler Co., *Henderson 5512* (M); hillsides of the Malheur, *Cusick 1622* (M, Po, UC); Silver Creek Valley, Harney Co., *Cusick 2615* (M, Po, UC).

43. Lomatium Nelsonianum Macbr. Contr. Gray Herb. n.s. **53**: 15. 1918.

Plants short-caulescent, about 4 dm. tall; leaves ovate, the blades up to 2.5 (?) dm. long, ternately to ternate-pinnately decompound, the leaflets linear or filiform (?), about 3 mm. long, less than 0.5 mm. broad, glabrous or sparingly hispid (?), the petioles 2.5–5 cm. long, sheathing below; peduncles exceeding the leaves; umbels 12–15-rayed, the rays unequal, ascending, 2.5–7 cm. long; involucel bracts filiform, sparingly hispid, up to half the length of the pedicels; umbellets 15–20-flowered, the flowers yellow (?), the fruiting pedicels 10–16 mm. long, minutely pubescent to glabrate, spreading; fruit oblong, 7–9 mm. long, 4–5 mm. broad, the wings slightly narrower than the body, the oil tubes 3 in the intervals, 6 on the commissure.

TYPE: *J. C. Nelson 1419*, dry rocky hillside near Mule Creek, Curry Co., Oregon, 21 June 1917 (G).

DISTRIBUTION: Known only from the type collection.

This species is inadequately known. The detached leaves on the type sheet are probably leaves of *Leptotaenia dissecta*.

They show the characteristic pubescence of that species, while the leaves attached to the stems of the plant are apparently glabrous. The stem leaves are so badly withered that it is difficult to study them but the leaflets seem to be a somewhat different shape from those of the detached leaves.

44. Lomatium minimum Mathias, comb. nov.

Cogswellia minima Mathias, Ann. Mo. Bot. Gard. **19**: 497. 1932.

Plants acaulescent, 1–3.5 cm. tall, glabrous or scabrous-puberulent; leaves narrowly oblong, the blades 0.5–2.5 cm. long, simply pinnate with 4–6 pairs of acute, distinct, entire or once-lobed leaflets, 2–10 mm. long, 1–1.5 mm. broad, the petiole 1–6 mm. long, entirely sheathing; peduncles equalling or slightly exceeding the leaves; umbels few-rayed, the rays unequal, 3–12 mm. long; involucel bracts subdimidiate, several, more or less distinct, narrow, acute, foliaceous, somewhat scarious-margined, shorter than to equalling the yellow flowers; umbellets few-flowered, the pedicels 1–2 mm. long; fruit oblong, 4–7 mm. long, 3–4 mm. broad, glabrous, the wings well-developed, about equalling the body, the oil tubes more or less obsolete.

TYPE: *Mathias 670*, near the hotel, dry slopes bordering Bryce Canyon, Utah, 8600 feet, 18 July 1929 (M).

DISTRIBUTION: Known only from the type locality and the Panguitch Plateau above Cedar Breaks, southwestern Utah.

SPECIMENS EXAMINED: UTAH: Cedar Breaks, *Jones* (Po); Panguitch, *Jones* (Po); on the edge of the Breaks, between the hotel and the camp ground, Cedar Breaks, near Cedar City, Iron Co., *Mathias 734* (M).

45. Lomatium oreganum Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 224. 1900.

Peucedanum oreganum Coult. & Rose, Rev. N. Am. Umbell. 64. 1888.
Cogswellia oregana (Coult. & Rose) Jones, Contr. Western Bot. **12**: 35. 1908.

Plants very low, acaulescent, 2.5–6 cm. tall, villosulose throughout, from a multicipital woody caudex; leaves oblong, the blades 1–3 cm. long, bipinnate, the leaflets crowded, oblong, 2–3 mm. long, about 1 mm. broad, apiculate, the petioles 0.5–2 cm. long, sheathing below; peduncles exceeding the leaves; umbels greatly reduced, with one fertile umbellet, the fertile

rays 1–5 mm. long, and 2–3 sessile sterile umbellets; involucel bracts linear, acute, not scarious-margined, longer than the yellow flowers; umbellets few-flowered, the fruiting pedicels 1–1.5 mm. long; fruit oblong, about 5 mm. long, 2.5 mm. broad, villosulose, the wings much narrower than the seed, the oil tubes 2–3 in the intervals, 4 on the commissure.

TYPE: *Cusick 1390*, alpine rocks, Blue and Eagle Creek Mts., Oregon, Aug. 1886–88 (F).

DISTRIBUTION: Known only from the type localities.

SPECIMENS EXAMINED: OREGON: cliff-sides of highest Blue Mts., head of Anthony's Creek, *Cusick 2247* (UC).

46. Lomatium Greenmanii Mathias, spec. nov.

Planta caulescens, 5–8 cm. alta; foliis oblongis, petiolis excludentibus, 1.5–2.5 dm. longis, 1–2-pinnatis, foliolis oblongis, 5–10 mm. longis, 2–2.5 mm. latis, apiculatis, marginibus subscabris, petiolis 1.5–3 cm. longis, folio caulino unico, parvo, pinnato; pedunculis foliis longioribus; umbellis cum 1–3 umbellulis fertilibus, radiis 1.5–2 mm. longis; bracteis involucelli paucis, filiformibus, ca. pedicellis aequalibus; umbellulis pauciforibus, pedicellis ca. 1 mm. longis, ovariis fructibusque glabris; fructibus ovatis, 3–5 mm. longis, 2 mm. latis, alis angustis, jugis dorsalibus filiformibus, vittis 1 in intervallis, 2 in commissura.

Plants low, caulescent, 5–8 cm. tall, from a multicipital woody caudex; leaves oblong, the blades 1.5–2.5 cm. long, 1–2-pinnate, the leaflets oblong, distinct, 5–10 mm. long, 2–2.5 mm. broad, apiculate, the margins slightly roughened, the petioles 1.5–3 cm. long, purplish sheathing below, the single stem leaf much reduced, pinnate, the petiole purplish, sheathing throughout; peduncles exceeding the leaves; umbels reduced to 1–3 fertile umbellets and 1–2 sessile sterile umbellets, the fruiting rays 1.5–2 mm. long; involucel bracts few, filiform, white-scarious, about equalling the pedicels; umbellets few-flowered, the flowers white, the fruiting pedicels about 1 mm. long, the ovaries glabrous; fruit ovate, 3.5 mm. long, 2 mm. broad, glabrous, the wings much narrower than the body, the dorsal ribs filiform, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Cusick 2458*, Wallowa Mts., head of Keystone Creek, 9000 feet, Oregon, fruiting August 4, 1900 (Po 78156).
DISTRIBUTION: Known only from the type collection.

This species is named in honor of Dr. J. M. Greenman, of the Missouri Botanical Garden, who first suggested to the writer the interesting problems in the study of this genus and whose advice and assistance has been greatly valued.

47. Lomatium Eastwoodae (Coult. & Rose) Macbr. Contr. Gray Herb. n.s. **56**: 35. 1918.

Cynomarathrum Eastwoodae Coult. & Rose, Contr. U. S. Nat. Herb. 7: 247. 1900.
Cogswellia Eastwoodae (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Plants acaulescent, 1–1.5 dm. tall from a subwoody caudex covered with old leaf sheaths; leaves narrowly oblong, scaberulent, the blades 2.5–7 cm. long, 1–2-pinnate, with 5–7 remote pairs of segments, the leaflets oblong-lanceolate, 2–4 mm. long, 1–1.5 mm. broad, crowded, apiculate, the petioles 1.5–4.5 cm. long, shortly sheathing below; peduncles exceeding the leaves; umbels 4–6-rayed, the fruiting rays unequal, 1–3 cm. long, ascending; involucel bracts few, linear, entire, much shorter than the pedicels; umbellets 2–15-flowered, the flowers yellow (?), the fruiting pedicels 6–17 mm. long, ascending; fruit oblong, 8–10 mm. long, about 6 mm. broad, glabrous, the wings equalling to broader than the body, the oil tubes 3–4 in the intervals, 6–8 on the commissure.

TYPE: *Eastwood*, Grand Junction, Colorado, May 1892 (US).
DISTRIBUTION: Known only from the type locality.
SPECIMENS EXAMINED: COLORADO: Grand Junction, *Bethel* s. n. (Cl), *84* (US), *Jones* (Po), *Eastwood* (UC).

48. Lomatium scabrum (Coult. & Rose) Mathias, comb. nov.

Cynomarathrum scabrum Coult. & Rose, Contr. U. S. Nat. Herb. 7: 247. 1900.
Cogswellia scabra (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Plants acaulescent, 1–3.5 dm. tall, from a subwoody caudex covered with old leaf sheaths; leaves narrowly oblong, the blades 5.5–10 cm. long, sparsely to densely scaberulent, 2–3-pinnate, the leaflets crowded, linear, 2–4 mm. long, 1–1.5 mm.

broad, apiculate, the petioles 3–10 cm. long, sheathing below, glabrous to scaberulent; peduncles exceeding the leaves, sparsely scaberulent to glabrate, especially above; umbels 7–14-rayed, the fruiting rays 1.5–4 cm. long, ascending, glabrous; involucel bracts distinct or shortly connate, linear, setaceous, shorter than to equalling the yellow flowers; umbellets many-flowered, the fruiting pedicels 5 (2 ?)–9 mm. long, ascending; fruit oblong-ovate, 7–9 mm. long, 4–6 mm. broad, glabrous, the wings less than to half the width of the body, the oil tubes 3–5 in the intervals, 4–10 on the commissure.

TYPE: *Jones 1864*, Frisco, Utah, 2400 m., 22 June 1880 (US type, Po).
DISTRIBUTION: Southwestern Utah.
SPECIMENS EXAMINED: UTAH: St. George, *Jones 1615* (Po); Detroit, Silver Reef, Frisco, *Jones* (Po); Cedar Canyon, Iron Co., *Cottam, Stanton & Harrison 3935* (Po); Copper Mine, *Jones 5006b* (Po); St. George, *Jones 5110o* (Po, UC); Diamond Valley, *Jones 5125g* (Po, US); St. George, *Gooding 799* (M, UC); Leeds, *Tidestrom 9391* (US).

49. Lomatium ciliolatum Jepson, Madroño 1: 155. 1924; Man. Fl. Pl. Calif. 723. 1925.

Plants acaulescent, about 1.5 dm. tall, from a long slender tap-root; leaves ovatish, 2–3.5 cm. long, margins finely and regularly ciliolate, pinnate, the leaflets 0.8–2 cm. long, irregularly pinnatifid into ovatish segments; peduncles exceeding the leaves; umbels 3–5-rayed, the rays unequal, 0.8–3.2 cm. long; involucel bracts several, ovate, with dark purple veins; umbellets few-flowered, the pedicels 2–4 mm. long; fruit elliptic, 7–8 mm. long, glabrous, the wings narrow, the oil tubes obscure, 4–5 in the intervals, 2 on the commissure.

No material of this species has been seen and this description has been adapted from those published by Jepson.

TYPE: *Jepson (14319)*, Soldiers Ridge near South Yollo Bolly, California.
DISTRIBUTION: Known only from the type locality, California.

50. Lomatium concinnum (Osterh.) Mathias, comb. nov.

Cogswellia concinna Osterh. Muhlenbergia 8: 44. 1912.

Plants short-caulescent, 1.2–2.5 dm. tall, glabrous, purplish below, from a long slender tap-root; leaves oblong, the blades 2–7 cm. long, bipinnate with the lower leaflets sometimes pin-

nately lobed, the leaflets distinct, linear, 2–11 mm. long, 1–2 mm. broad, rounded at the apex, sometimes apiculate, the petioles 1.5–5.5 cm. long, sheathing below; peduncles exceeding the leaves; umbels 8–13-rayed, the fruiting rays 5–6, subequal, 2.5–4 cm. long, spreading; involucel bracts conspicuous, dimidiate, foliaceous, ovate-lanceolate, acute, entire or rarely lobed towards the apex, usually many-nerved, connate below, equalling to longer than the yellow flowers; umbellets many-flowered, the fruiting pedicels 1–2 mm. long; fruit ovate, 5–8 mm. long, 4–5 mm. broad, the wings less than half the width of the body, the oil tubes 4–5 in the intervals, about 10 on the commissure.

TYPE: *Osterhout 4515*, Paeonia, Delta Co., Colorado, 21 May 1911 (NY, Po type coll.).

DISTRIBUTION: Southwestern Colorado.

SPECIMENS EXAMINED: COLORADO: Cimarron, *Baker 22* (M, Po, UC); north fork of the Gunnison, *Purpus 587* (UC).

51. Lomatium Parryi (Wats.) Macbr. Contr. Gray Herb. n.s. 56: 35. 1918.

Peucedanum macrocarpum Parry, Am. Nat. 9: 272. 1875, nom. nud., not Nutt. (1840).

P. Parryi Wats. Proc. Am. Acad. 11: 143. 1876.

P. scopulorum Jones, Contr. Western Bot. 8: 31. 1898.

Cynomarathrum Parryi (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 246. 1900.

Cogswellia Parryi (Wats.) Jones, Contr. Western Bot. 12: 32. 1908.

Lomatium Parryi (Wats.) Jepson, Madroño 1: 157. 1924, in err.

Cogswellia Cottami Jones, Contr. Western Bot. 16: 36. 1930.

Plants acaulescent, glabrous, 2–4 dm. tall, from a long somewhat stout tap-root; leaves narrowly oblong, the blade 10–20 cm. long, 2–3-pinnate, the lowermost pinnae more divided than the upper, the leaflets linear, 2–9 mm. long, about 1 mm. broad, entire, cuspidate, the petioles 6–10.5 cm. long, short-sheathing; peduncles clustered from the old sheaths, equalling to somewhat exceeding the leaves; umbels about 15-rayed, the rays subequal, 2–4.5 cm. long, suberect; involucel bracts several, linear, acute, subscarious, sometimes cleft, equalling or exceeding the yellow flowers; umbellets about 10-flowered, the fruiting pedicels 10–17 mm. long; fruit oblong, 9–12 mm. long, 4–6 mm.

broad, the wings equalling or somewhat wider than the body, the oil tubes 2–3 in the intervals, 4 on the commissure.

TYPE: *Parry 85*, southern Utah (G).

A mixture of material was distributed under *Parry 85*; the type of this species is a glabrous specimen.

DISTRIBUTION: Mountain ranges, southeastern Utah to the Panamint Mts., California.

SPECIMENS EXAMINED: UTAH: Sierra La Sal, *Purpus* (M, UC, US); Apex Mine, Beaver Dam Mts., Washington Co., *Cottam 4098* (M, Po type of *C. Cottami*); *Palmer 178* (M); Silver Reef, *Jones 5149s* (M, Po, US). NEVADA: Meadow Valley Wash, *Goodding 629* (M, US); Duck Creek Canyon, 4 mi. s. e. of Paine's Ranch, *A. E. Hitchcock 1402* (US). CALIFORNIA: Surprise Canyon, Panamint Mts., Inyo Co., *Howell 3898* (M); Pleasant Canyon, Panamint Mts., *Jones* (M type coll. of *P. scopulorum*); head of Wild Rose Canyon, Panamint Mts., *Mathias 827* (M).

52. Lomatium Nuttallii (Gray) Macbr. Contr. Gray Herb. n.s. **56**: 35. 1918.

Seseli Nuttallii Gray, Proc. Am. Acad. **8**: 287. 1870, in part.

Peucedanum graveolens Wats. Bot. King Exp. 128. 1871, not Benth. & Hook. (1867).

P. Kingii Wats. Proc. Am. Acad. **22**: 474. 1887.

Cynomarathrum Nuttallii (Gray) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 245. 1900.

Cogswellia Nuttallii (Gray) Jones, Contr. Western Bot. **12**: 32. 1908.

Plants acaulescent, glabrous, 1.5–4.2 dm. tall, from a multicipital subwoody caudex covered with old leaf sheaths; leaves oblong, the blades 5.5–13 cm. long, 1–2-pinnate or ternate- or quinate-pinnate, the leaflets remote, linear, 10–50 mm. long, 1–2 mm. broad, entire, cuspidate, the petioles 3–15 cm. long, shortly sheathing below; peduncles stout, usually greatly exceeding the leaves in the mature plant; umbels 5–16-rayed, the fruiting rays 15–43 mm. long, erect to suberect; involucel bracts distinct or shortly connate, linear, acute to acuminate, entire or once-lobed near the base, longer than or equalling the yellow flowers, sometimes reflexed; umbellets 15–20-flowered, the fruiting pedicels 3–7 mm. long, suberect; fruit narrowly oblong, 9–13 mm. long, 3–4 mm. broad, the wings about half the width of the body, the oil tubes 3–5 in the intervals, 6–10 on the commissure.

TYPE: *Nuttall*, Rocky Mountains.

DISTRIBUTION: Southwestern Wyoming to northwestern New Mexico and eastern Nevada, with one collection from Nebraska *(Rydberg 129*, Scotts Bluff in the Pass [US]).

TYPICAL SPECIMENS: WYOMING: lower slopes, Piney Mt., 25 miles west of Big Piney, Sublette Co., *Payson & Payson 2707* (M, Po, UC, US). UTAH: clay slopes near Mill Creek, foothills of Uinta Mts., Summit Co., 8200 ft., *Payson & Payson 4307* (M, US), *4857* (Po, UC).

52a. Lomatium Nuttallii (Gray) Macbr. var. alpinum (Wats.) Mathias, comb. nov.

Peucedanum graveolens Wats. var. *alpinum* Wats. Bot. King Exp. 129. 1871.
P. Kingii Wats. var. *alpinum* (Wats.) Coult. & Rose, Rev. N. Am. Umbell. 71. 1888.
Cynomarathrum alpinum (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 245. 1900.
Cogswellia Nuttallii (Gray) Jones var. *alpina* (Wats.) Jones, Contr. Western Bot. 12: 32. 1908.
Lomatium alpinum (Wats.) Macbr. Contr. Gray Herb. n.s. 56: 35. 1918.

Similar to the species but usually lower, up to 3 dm. tall; leaves usually less divided; rays 3–6; pedicels 4–10 mm. long.

TYPE: *Watson 464*, East Humboldt Mts., Nevada (US).

DISTRIBUTION: Western Utah and adjacent Nevada.

SPECIMENS EXAMINED: UTAH: Gold Hill, Black Mt., *Jones* (Po). NEVADA: Shellbourne, Osceola, Duck Creek, Muncy, *Jones* (Po); Glencoe, *Jones* (Po, US); rocky slopes, Highland Peak, *Purpus 6282* (Po, UC, US); 7 mi. east of Ely, *A. E. Hitchcock 1313* (US).

53. Lomatium Hallii (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 224. 1900.

Peucedanum nudicaule Gray, Proc. Am. Acad. 8: 385. 1872, not Nutt. (1840).
P. Hallii Wats. Proc. Am. Acad. 11: 141. 1876.
P. microcarpum Howell ex Coult. & Rose, Rev. N. Am. Umbell. 65. 1888.
Lomatium Leibergii Coult. & Rose, Contr. U. S. Nat. Herb. 7: 224. 1900.
L. microcarpum (Howell) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 230. 1900.
Cogswellia Hallii (Wats.) Jones, Contr. Western Bot. 12: 35. 1908.
C. microcarpa (Howell) Jones, Contr. Western Bot. 12: 35. 1908.
C. Leibergii (Coult. & Rose) Jones, Contr. Western Bot. 12: 35. 1908.

Plants short-caulescent, 2.0–3.5 dm. tall, glabrous except for an occasional slight scaberulence in the inflorescence; leaves oblong, the blades 4.5–10 cm. long, tripinnate, the leaflets distinct except the uppermost, linear or oblong, 2–4 mm. long, less than 1 mm. broad, entire, apiculate, the petioles 3–6 cm.

long, sheathing to about the middle, the sheath scarious-margined, purplish; fruiting peduncles exceeding the leaves; umbels 9–17-rayed, the rays unequal, 1.3–5 cm. long, spreading, glabrous or scaberulent below; involucel bracts linear-lanceolate, acuminate, equalling the yellow flowers; umbellets about 30-flowered, the fruiting pedicels 4–7 mm. long, glabrous or scaberulent; fruit oblong, 5–7 mm. long, about 3 mm. broad, the wings about one-half the width of the body, the oil tubes 2–3 in the intervals, 5 on the commissure.

TYPE: *Hall 211*, "Oregon" (probably Silver Creek, Marion Co.) (G type, NY).

DISTRIBUTION: River valleys, western slopes of the Cascade Mts., Oregon.

SPECIMENS EXAMINED: OREGON: on cliffs, Roseburg, Umpqua Valley, Howell (M, NY, Th); rocky bluff near Myrtle Creek, Douglas Co., *Thompson 10174* (NY, Th); *Leiberg 4166* (collection of 1899) (US type of *L. Leibergii*); moist bluffs, edge of coniferous woods, 2 mi. above Oakridge, Middle Fork of Willamette River, Cascade Mts., Lane Co., *Constance, Henderson & Rollins 1471* (Th, UC).

The specimens of Howell without number cited above agree in date of collection and locality with *Howell 709*, the type of *Peucedanum microcarpum*, and are a perfect match for the type specimen of *P. Hallii*, *Hall 211* in part.

The type sheet of *Peucedanum Hallii* in the Gray Herbarium has mounted on it five distinct plants. Two of these plants have finely cut leaves, nearly mature fruit and 3 oil tubes in the intervals. These are to be considered the type of the species. The other three specimens may belong together and are *Lomatium angustatum*. The specimens of *Hall 211* have been distributed as coming variously from Mt. Hood and from Silver Creek, Marion County, Oregon. The specimens of *L. angustatum* may well have been collected at Mt. Hood. Because of the Mt. Hood locality it has been generally considered that *L. Hallii* was an alpine plant and consequently it has been misunderstood and in most cases confused with *L. angustatum*.

The collection of Leiberg (*4166* in 1899), the type of *Lomatium Leibergii*, was probably made in the valleys on the western slopes of the Cascades since we have records of other collections by Leiberg in the summer of 1899 from that region, namely, from east of Medford, Abbott Butte, Big Butte Creek, Lower Applegate Creek, and Ashland.[1]

54. Lomatium Martindalei Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 225. 1900.

Peucedanum Martindalei Coult. & Rose, Bot. Gaz. **13**: 142. 1888; Rev. N. Am. Umbell. 66. 1888.

Cogswellia Martindalei (Coult. & Rose) Jones, Contr. Western Bot. **12**: 34. 1908.

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[1] C. P. Smith, A distributional catalogue of the lupines of Oregon. Contr. Dudley Herb. **1**(1). 1927.

Plants short-caulescent, purplish, 1.5–2.5 dm. tall, from a long, somewhat thickened tap-root; leaves oblong to ovate-oblong, the blades 2.5–5 cm. long, 1–2-pinnate, minutely roughened to glabrous on the margins and veins below, the leaflets oblong to cuneate, 5–10 mm. long, 2–7 mm. broad, pinnately lobed to serrate above, the petioles 2.5–5 cm. long, sheathing below; peduncles exceeding the leaves; umbels 4–7-rayed, the fruiting rays unequal, 1–5.5 cm. long, suberect; involucel bracts few, filiform, shorter than the pedicels; umbellets 10–20-flowered, the fruiting pedicels 2–3, 7–10 mm. long; fruit oblong, 13–16 mm. long, 7–8 mm. broad, the wings about equalling the body, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Howell*, "rocky places, Cascade Mountains, Oregon," May–June 1880.
DISTRIBUTION: Cascade Mts., Oregon.
SPECIMENS EXAMINED: OREGON: Coral Springs, *Leiberg 609* (UC); rocky places, Cascade Mountains, *Howell* (NY type coll.); alpine slopes of Crater Lake, Klamath Co., *Thompson 12286* (Th); Wizard Island, Crater Lake, *Heller 13462* (M).

55. **Lomatium latilobum** (Rydb.) Mathias, comb. nov.

Cynomarathrum latilobum Rydb. Bull. Torrey Bot. Club **40**: 73. 1913.

Plants acaulescent, 0.8–1.8 dm. tall, glabrous, from a semi-woody deep-seated root, caudex multicipital, broadly caespitose, the branches several, clothed with old leaf sheaths; leaves several from each crown, erect, oblong, the blades 2–8 cm. long, pinnate, rarely bipinnate, the leaflets lanceolate, sessile, in 3–5 pairs, 3–30 mm. apart, 5–28 mm. long, 2–6 mm. broad, entire, acute, mucronulate, the petioles 2–10.5 cm. long, shortly sheathing below; peduncles equalling to exceeding the leaves; umbels 4–10-rayed, the fruiting rays 2–5, subequal, 5–12 mm. long, spreading; involucel bracts dimidiate, distinct or connate below, linear to lanceolate, acute, prominently nerved, mostly exceeding the pedicels, sometimes reflexed; umbellets few-flowered, the flowers yellow (?), the fruiting pedicels 1–4 mm. long; fruit oblong, 7–12 mm. long, 3–5 mm. broad, the wings narrower than to equalling the body, the oil tubes 1–2 in the intervals, 2–4 on the commissure.

TYPE: *Rydberg & Garrett 8371*, proposed dam site, near Wilson Mesa, Grand Co., Utah, 1 July 1911, (NY type, Garrett, US).

DISTRIBUTION: Southeastern Utah.

SPECIMENS EXAMINED: UTAH: Moab, *Jones* (Po); Sierra La Sal, *Purpus* (Po), *Purpus 7150* (Po, UC).

56. Lomatium megarrhizum (A. Nels.) Mathias, comb. nov.

Musenium tenuifolium acc. to Hook. Lond. Jour. Bot. 6: 237. 1847, not Nutt. (1840).

Peucedanum megarrhiza A. Nels. Bull. Torrey Bot. Club 26: 130. 1899.

Cynomarathrum megarrhizum A. Nels. ex Rydb. Fl. Rocky Mts. 629, 1064. 1917.

Plants acaulescent, 1–3 dm. tall, glabrous, clustered from a broad, semi-woody, deep-seated root, the caudex multicipital, broadly caespitose, the branches numerous, crowded, thickly clothed with old leaf sheaths; leaves few to several from each crown, rigidly erect, linear-oblong, the blades 5.5–9.5 cm. long, pinnate, the leaflets in 2–5 remote pairs, 11–25 mm. long, about 1 mm. broad, entire and narrowly linear, cuspidate to irregularly and remotely pinnatified, the segments few, linear, 1–10 mm. long, 1 mm. broad, cuspidate, the petioles 4.5–8 cm. long, shortly sheathing below; peduncles equalling to shortly exceeding the leaves; umbels 10–11-rayed, the rays all fertile, subequal, 8–23 mm. long, spreading to reflexed; involucel bracts connate below, subdimidiate, linear, acute to short-acuminate, longer than the pedicels; umbellets about 20-flowered, the flowers yellow, the fruiting pedicels 1–2 mm. long, spreading to reflexed; fruit oblong, 5–8 mm. long, 2.5–3 mm. broad, the wings narrower than the body, the oil tubes about 3 in the intervals, 6–10 on the commissure.

TYPE: *Nelson 4769*, Point of Rocks, Wyoming, 16 June 1898.

DISTRIBUTION: Southwestern Wyoming.

SPECIMENS EXAMINED: WYOMING: Upper Platte, *Geyer 220* (M photo); Point of Rocks, *Nelson 4769* (M type coll.); Carter, Uinta Co., *Goodding 1186* (M, Po, UC, US); shale slopes, 6 mi. east of Big Piney, *Payson & Payson 2596* (M, Po, UC, US); Steamboat Mt., Sweetwater Co., *Nelson 7080* (M, Po, US); rim of Botes Hole, *Payson & Payson 4725* (M).

57. Lomatium simplex (Nutt.) Macbr. Contr. Gray Herb. n.s. 56: 34. 1918.

Peucedanum triternatum (Pursh) Nutt. var. *platycarpum* Torr. Stansb. Rep. 389. 1852.

P. triternatum Torr. acc. to Sitgreaves Rep. 160. 1853, not Nutt. (1840).
P. simplex Nutt. ex Wats. Bot. King Exp. 129. 1871.
Lomatium platycarpum (Torr.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 226. 1900, as to glabrous fruit forms.
Cogswellia platycarpa (Torr.) Jones, Contr. Western Bot. 12: 32. 1908.
C. simplex (Nutt.) Jones, Bull. Univ. Mont. Biol. Ser. 15: 41. 1910.
C. simplex (Nutt.) Rydb. Bull. Torrey Bot. Club. 40: 74. 1913, in err.

Plants caulescent or acaulescent, 2–6 dm. tall, clustered from a long slender tap-root; stems mostly simple, few-leaved, densely puberulent; leaves obovate, the blades 11–20 cm. long, biternate, the leaflets linear, acute, 2.5–11.5 cm. long, 3–6 mm. broad, glabrous above, glabrous to densely puberulent below, the petioles glabrous to puberulent, 6–14 cm. long, sheathing to near the middle; peduncles densely puberulent, exceeding the leaves; umbels 8–17-rayed, the rays unequal, 1.5–5.8 cm. long, spreading to ascending; involucel bracts linear or filiform, acute to acuminate, glabrous or puberulent, shorter than the pedicels; umbellets 10–30-flowered, the flowers yellow, the fruiting pedicels 1–9 mm. long; fruit broadly oblong to suborbicular, 7–14 mm. long, 7–10 mm. broad, the wings broader than the body, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Nuttall*, Rocky Mts. (Ph).

DISTRIBUTION: Western Montana to Utah, southwestern Colorado, west to Washington and Oregon.

TYPICAL SPECIMENS: IDAHO: Shoshone Falls, *Macbride 1722* (M, UC). UTAH: Goodman Ranch, Bear River, Summit Co., *Payson & Payson 4866* (M). WASHINGTON: *Canby 798* (UC).

According to Section 6, Article 49 of the International Rules of Botanical Nomenclature "When . . . a subdivision becomes a species, . . . the earliest name received by the group in its new position must be regarded as valid. . . ." Thus the specific name *simplex* must be used instead of *platycarpa*.

57a. Lomatium simplex (Nutt.) Macbr. var. **leptophyllum** (Hook.) Mathias, comb. nov.

Peucedanum triternatum (Pursh) Nutt. var. *leptophyllum* Hook. Lond. Jour. Bot. 6: 235. 1847.
Cogswellia leptophylla (Hook.) Rydb. Bull. Torrey Bot. Club 40: 74. 1913.

Similar to the species but the ovaries and young fruit puberulent.

TYPE: *Geyer 505*, "crevices of Trappe masses, on the slopes of the high plains of Kooskooskee River," Idaho, July.

DISTRIBUTION: Western Montana and Wyoming to British Columbia, eastern Washington, and Oregon.

TYPICAL SPECIMENS: MONTANA: Missoula, *Kirkwood 1730* (UC, UM), *2424* (Po, UM); Hamilton, *Blankinship 705* (M, UC, UM). WYOMING: Green River Lakes, Sublette Co., *Payson & Payson 4454* (M). IDAHO: Boise, *Clark 40* (M, NY, UC).

58. Lomatium triternatum (Pursh) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 227. 1900.

Seseli triternatum Pursh, Fl. 1: 197. 1814.

Eulophus triternatus (Pursh) Nutt. Jour. Acad. Philad. 7: 27. 1834.

Peucedanum triternatum (Pursh) Nutt. ex Torr. & Gray, Fl. N. Am. 1: 626. 1840.

Seseli biternatum Pursh, ex Torr. & Gray, Fl. N. Am. 1: 626. 1840, err. in synon.

Peucedanum Nuttallii Walp. Rep. 2: 411. 1843, not *Seseli Nuttallii* Gray (1870).

Cogswellia triternata (Pursh) Jones, Contr. Western Bot. 12: 32. 1908.

Plants caulescent or acaulescent, 1.7–8 dm. tall, puberulent to glabrate, from a long slender tap-root; leaves broadly obovate, the blades 7–15 cm. long, ternate or quinate, then pinnate to bipinnate, the leaflets few, linear, 1.5–12.6 cm. long, 0.5–7 mm. broad, entire, acute, the petioles 7–20 cm. long, sheathing about to the middle, purplish below, the stem leaves 1–2, smaller, the petioles entirely sheathing; peduncles exceeding the leaves; umbels 10–20-rayed, the fruiting rays unequal, 1.2–5.5 cm. long, spreading to suberect; involucel bracts several, filiform, about equalling the pedicels; umbellets many-flowered, the flowers yellow, the ovaries glabrous, the fruiting pedicels 3–5 mm. long; fruit oblong, 9–13 mm. long, 3–5 mm. broad, glabrous, the wings narrower than the body, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Lewis*, "on the waters of Columbia River" (probably on the main Kooskooskee River, vicinity of Cotter's or Potlatch Creek, below mouth of the North Fork), Idaho.

DISTRIBUTION: Western Montana and Wyoming to western Washington, southwestern Oregon, and northeastern California.

TYPICAL SPECIMENS: IDAHO: Josephus Lakes, Custer Co., *Macbride & Payson 3587* (M). WASHINGTON: Pullman, Whitman Co., *Elmer 846* (M). OREGON: near Prairie City, Grant Co., *Henderson 5187* (M).

Cogswellia triternata (Pursh) Coult. & Rose forma **lancifolia** St. John, Fl. S.E. Wash. & Adj. Ida. 293. 1937, has been published, but no specimens have been seen. According to description, it differs from *Lomatium triternatum* in its linear-lanceolate leaves 1 cm. or more in width.

58a. Lomatium triternatum (Pursh) Coult. & Rose var. **anomalum** (Jones) Mathias, comb. nov.

Lomatium anomalum Jones, ex Coult. & Rose, Contr. U. S. Nat. Herb. 7: 237. 1900.

L. giganteum Coult. & Rose, Contr. U. S. Nat. Herb. 7: 240. 1900.

? *Cogswellia anomala* Jones, Contr. Western Bot. 12: 32. 1908.

? *C. gigantea* (Coult. & Rose) Jones, Contr. Western Bot. 12: 32. 1908.

? *Lomatium nudicaule* (Pursh) Coult. & Rose var. *puberulum* Jepson, Madroño 1: 159. 1924.

? *Peucedanum nudicaule* Nutt. var. *puberulum* Gray, ex Jepson, Madroño 1: 159. 1924, nom. nud. in synon.

Plants caulescent; leaflets ovate-lanceolate to narrowly obovate, 15–65 mm. long, 3–8 mm. broad, acute, entire or the uppermost rarely 3-toothed to deeply lobed; umbels 10–22-rayed, the fruiting rays 1.5–8 cm. long, puberulent to glabrate; fruiting pedicels 2–8 mm. long; fruit 13–22 mm. long, 8–16 mm. broad, glabrous (ovaries and young fruit glabrous).

TYPE: *Jones*, rocky gumbo soil, slopes of Indian Valley, Washington Co., Idaho, 1200 meters, 15 July 1899 (Po).

DISTRIBUTION: Northwestern to southwestern Idaho (west to Oregon and California?).

TYPICAL SPECIMENS: IDAHO: Lewiston, Nez Perce Co., *Heller & Heller 3132* (M, NY, UC); forks of St. Mary's River, Coeur d'Alene Mts., *Leiberg 1128* (M, Po, UC); hills near Boise, *Mulford* (NY); Upper Ferry, Clearwater River above Lewiston, *Sandberg, MacDougal & Heller 28* (NY).

Lomatium giganteum Coult. & Rose and *L. nudicaule* var. *puberulum* Jepson are identical. The *Bolander* specimen (UC type coll. of *L. nudicaule* var. *puberulum*), though immature, is a good match for the type of *L. anomalum* Jones, so these plants have been questionably referred to var. *anomalum* even though they are known only from northwestern California, and typical *L. anomalum* has so far been collected only in western Idaho. Further collections in the intervening area may show that the distribution is continuous in which case there will be no question as to identity.

58b. Lomatium triternatum (Pursh) Coult. & Rose var. **macrocarpum** (Coult. & Rose) Mathias, comb. nov.

Peucedanum triternatum (Pursh) Nutt. var. *macrocarpum* Coult & Rose. Rev. N. Am. Umbell. 70. 1888.

P. triternatum (Pursh) Nutt. var. *robustius* Coult. & Rose, Contr. U. S. Nat. Herb. 3: 228. 1895.

Lomatium robustius Coult. & Rose, Contr. U. S. Nat. Herb. 7: 228. 1900.

Cogswellia triternata (Pursh) Jones var. *robustior* (Coult. & Rose) Jones, Contr. Western Bot. 12: 32. 1908.

C. robustior Coult. & Rose, Contr. U. S. Nat. Herb. 12: 451. 1909.

Leaves 12–22 cm. long, ternate or quinate, then biternate to bipinnate, the leaflets linear, sometimes ovate-lanceolate as in var. *anomala*, 1.5–14.5 cm. long, 1–11 mm. broad, entire; umbels 5–18-rayed, the fruiting rays unequal, 0.6–10.5 cm. long; fruiting pedicels 2.5–9 mm. long, the ovaries and young fruit puberulent, the mature fruit glabrous or rarely sparsely puberulent, oblong, 8–20 mm. long, 4–6 mm. broad.

TYPE: *Suksdorf 502*, low grounds, W. Klickitat Co., Washington, May–July 1883 (US).

DISTRIBUTION: Alberta to British Columbia, south to northern California and northwestern Nevada.

TYPICAL SPECIMENS: IDAHO: Big Willow, Canyon Co., *Macbride 107* (M, NY, UC). WASHINGTON: near Peshastin, *Sandberg & Leiberg 596* (M, NY, UC). OREGON: Maurey's Mts., *Cusick 2700* (M, NY, UC).

58c. Lomatium triternatum (Pursh) Coult. & Rose var. **brevifolium** (Coult. & Rose) Mathias, comb. nov.

Peucedanum triternatum (Pursh) Nutt. var. *brevifolium* Coult. & Rose, Rev. N. Am. Umbell. 70. 1888.

Lomatium brevifolium Coult. & Rose, Contr. U. S. Nat. Herb. 7: 232. 1900.

Cogswellia brevifolia (Coult. & Rose) Jones, Contr. Western Bot. 12: 32. 1908.

Plants caulescent, 1.5–3.5 dm. tall, densely soft-puberulent; leaves quinately decompound, the final divisions pinnate, the leaflets remote, linear, 3–22 mm. long, 1–3 mm. broad; umbels 9–11-rayed; fruiting pedicels 1–4 mm. long; fruit linear-oblong, 6–8 mm. long, about 2 mm. broad, densely puberulent.

TYPE: *Howell 379*, Klickitat Co., Washington, 1881.

DISTRIBUTION: Klickitat Co., Washington and adjacent Oregon.

SPECIMENS EXAMINED: WASHINGTON: *Wilkes Exp. 1053* (NY); Klickitat Hills, *Howell 1368* (M, NY, Th, UC); opp. The Dalles, Klickitat Co., *Thompson 11545* (Th); near Maryhill, Klickitat Co., *Thompson 8176* (M, Th). OREGON: near The Dalles, *Mathias 779* (M); *Howell & Howell* (NY); Dalles, *Kellogg 183* (UC).

58d. Lomatium triternatum (Pursh) Coult. & Rose var. **alatum** (Coult. & Rose) Mathias, comb. nov.

Peucedanum triternatum (Pursh) Nutt. var. *alatum* Coult. & Rose, Rev. N. Am. Umbell. 70. 1888.
Lomatium alatum Coult. & Rose, Contr. U. S. Nat. Herb. 7: 228. 1900.
Cogswellia triternata (Pursh) Jones var. *alata* (Coult. & Rose) Jones, Contr. Western Bot. 12: 32. 1908.
C. alata Coult. & Rose, Contr. U. S. Nat. Herb. 12: 448. 1909.

Involucels few or absent; ovaries and young fruit pubescent, the wings half as broad to about equalling the body.

TYPE: *M. K. Curran*, "Folsom," California.
DISTRIBUTION: Northeastern California and adjacent Oregon.
SPECIMENS EXAMINED: OREGON: Lakeview, *Peck 15470* (Th).

A doubtful variety poorly distinguished from variety *macrocarpum* since the wing character may be a chance variation. The locality for the type collection is probably an error.

59. Lomatium Cusickii (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 226. 1900.

Peucedanum Cusickii Wats. Proc. Am. Acad. 21: 453. 1886.
Cogswellia Cusickii (Wats.) Jones, Contr. Western Bot. 12: 32. 1908.
C. brecciarum Jones, Contr. Western Bot. 12: 32, 37. 1908.
C. altensis Jones, Bull. Univ. Mont. Biol. Ser. 15: 41. 1910.
Cynomarathrum brecciarum (Jones) Rydb. Fl. Rocky Mts. 630, 1064. 1917.

Plants caulescent, 1–2.2 dm. tall, caespitose, from long slender fusing tap-roots; leaves obovate to transversely ovate, the blades 3.5–12 cm. long, glabrous to slightly scaberulent, ternately compound, the leaflets few, filiform to linear, 6–75 mm. long, 0.5–2 mm. broad, apiculate, the petioles 1–9 cm. long, more or less sheathing, purplish; peduncles exceeding the leaves, glabrous; umbels 5–12-rayed, the rays unequal, 1–3.5 cm. long; involucel bracts filiform to linear-acuminate, scarious-margined, about equalling the white or purplish flowers; umbellets about 10-flowered, the fruiting pedicels 2–6 mm. long; fruit oblong, 11–13 mm. long, 4–6 mm. broad, the wings about equalling the body, the oil tubes 1–3 in the intervals, 5 on the commissure.

TYPE: *Cusick*, "on the highest summits of the Eagle Creek Mountains, Union County, Oregon," September 1885, in fruit.

DISTRIBUTION: Mountains of western Montana to eastern Oregon, 6000 to 9300 feet.

SPECIMENS EXAMINED: MONTANA: Mt. Haggin near Anaconda, Ryan's Lake, Deer Lodge Valley, *Jones* (Po); Alta, *Jones* (Po type of *C. altensis*). IDAHO: Seven Devils Mts., Washington Co., *Jones* (Po), *Cusick 2228* (M). OREGON: *Cusick 3335* (M, NY, Po, UC); south slope of Wallowa Mts., *Cusick 2441* (M, Po, NY); Powder River Mts., *Piper 2333* (M, NY, Po), *Cusick* (UC); *Cusick 1280* (Po, UC).

The type of *Cogswellia brecciarum* Jones is a collection by Jones from Mt. Haggin, Montana, 3 August 1905. No material has been found collected by Jones at that locality on that date; however, collections of July 20, 1905, at 8000 feet on Mt. Haggin (Po 78273, 78277) match the description of *C. brecciarum* even to the immature fruit. These specimens are certainly true *L. Cusickii* and on the basis of the description of *C. brecciarum* and the collections of Jones on Mt. Haggin cited above there seems to be little question that *C. brecciarum* is conspecific with *L. Cusickii*.

60. Lomatium laevigatum (Nutt.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 225. 1900.

Peucedanum laevigatum Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 627. 1840.
Cogswellia laevigata (Nutt.) Jones, Contr. Western Bot. **12**: 32. 1908.

Plants caulescent, 2.5–3.7 dm. tall, glabrous, tufted at the base; leaves ovate, the blades 7–12 cm. long, ternate, then 2–3-pinnate, the leaflets distinct, linear, 5–35 mm. long, 1–3 mm. broad, acute, minutely apiculate, the petioles 0.5–1.5 dm. long, sheathing below; peduncles exceeding the leaves; umbels 9–20-rayed, the rays unequal, 7–45 mm. long, ascending; involucel bracts usually absent; umbellets 10–30-flowered, the flowers yellow, the fruiting pedicels 4–10 mm. long; fruit oblong, 6–10 mm. long, 4–6 mm. broad, the wings slightly narrower than to equalling the body, the oil tubes solitary in the intervals, 2 on the commissure.

TYPE: *Nuttall*, Blue Mts., Oregon (Ph).

DISTRIBUTION: Columbia River Valley, Washington and Oregon.

SPECIMENS EXAMINED: WASHINGTON: near Columbus, Klickitat Co., *Suksdorf 863* (M, UC); along Beverly Creek, Wenatchee Mts., Kittitas Co., *Thompson 6333* (M, Th). OREGON: bluffs of the Columbia at Grants, *Howell 1505* (M, UC); bluffs of Columbia River, Summit, *Henderson 393* (UC).

61. Lomatium Suksdorfii (Wats.) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 239. 1900, in part, and as to name-bringing synonym.

Peucedanum Suksdorfii Wats. Proc. Am. Acad. **20**: 369. 1885.
Cogswellia Suksdorfii (Wats.) Jones, Contr. Western Bot. **12**: 32. 1908.

Plants caulescent, glabrous, 9–21 dm. tall; stems from a cluster of old leaf sheaths; leaves obovate, the blades about 20 cm. long, quinate, biquinate, or biternate, then 1–2-pinnate, the leaflets remote, linear, acute, 10–30 mm. long, 1–4 mm. broad, the petioles 14–15 cm. long, sheathing below, cauline leaves similar or with an entirely sheathing petiole; peduncles exceeding the leaves; umbels 13–25-rayed, the rays unequal, 3–11 cm. long, spreading; involucel bracts several, linear, acuminate, subscarious, about equalling the yellow flowers, deciduous in the mature plant; umbellets many-flowered, the fruiting pedicels 6–17 mm. long; fruit linear-oblong, 15–32 mm. long, 7–8 mm. broad, the wings narrower than the body, the oil tubes 1, rarely 3–4, in the intervals, 2 on the commissure.

TYPE: *Suksdorf*, on dry rocky mountain sides, W. Klickitat Co., Washington, June and July 1883 (M, NY, UC type coll.).
DISTRIBUTION: Klickitat Co., Washington.
SPECIMENS EXAMINED: WASHINGTON (Klickitat Co.): Bingen, *Suksdorf* (NY); *Suksdorf* (M, NY); *Suksdorf 503* (NY).

61a. Lomatium Suksdorfii (Wats.) Coult. & Rose var. **Thompsonii** Mathias, var. nov.

Planta foliis caulibusque pubescentibus, foliis biternatis, rare quinatis, deinde bipinnatis, foliolis 8–16 mm. longis, 1–2 mm. latis; bracteis involucelli filiformibus, floribus longioribus; ovariis et fructibus immaturis puberulis, fructibus maturis glabratis; fructibus 24–28 mm. longis, 8–10 mm. latis.

Leaves biternate, rarely quinate, then bipinnate, the leaflets short, 8–16 mm. long, 1–2 mm. broad; foliage and stems finely and sparingly pubescent; involucel bracts filiform, longer than the flowers; ovaries and young fruit puberulent, the mature fruit glabrate; fruit 24–28 mm. long, 8–10 mm. broad.

TYPE: *Sandberg & Leiberg 489*, Peshastin, Okanogan Co., 340 m., 19 July 1893 (M 137759 TYPE, NY, UC).
DISTRIBUTION: Chelan and Okanogan counties, Washington.

SPECIMENS EXAMINED: WASHINGTON: *Vasey 300* (NY); open slopes above Ingalls Creek, Chelan Co., *Thompson 9000* (M, NY, UC); rocky bank 2 miles west of Dryden, Chelan Co., *Thompson 5989* (M, Th).

This variety is named in honor of Mr. J. W. Thompson, of Seattle, Washington, whose collections in that state have greatly aided in the study of this genus.

62. Lomatium Brandegei (Coult. & Rose) Macbr. Contr. Gray Herb. n.s. **56**: 35. 1918.

Peucedanum Brandegei Coult. & Rose, Bot. Gaz. **13**: 210. 1888; Rev. N. Am. Umbell. 72. 1888.

Cynomarathrum Brandegei Coult. & Rose, Contr. U. S. Nat. Herb. 7: 246. 1900.

Cogswellia Brandegei (Coult. & Rose) Jones, Contr. Western Bot. **12**: 32. 1908.

Plants caulescent, 1.5–6 dm. tall, from an elongated tap-root; stems glabrous, alternately few-branched; leaves mostly basal from a cluster of dried sheaths, obovate, the blades 8–20 cm. long, ternate, then 2–3-pinnate, the leaflets remote, linear-lanceolate to oblanceolate, 10–40 mm. long, 1.5–8 mm. broad, acute, mucronate, the margins glabrous to granulate-roughened, the petioles 1.5–14 cm. long, shortly sheathing below; peduncles exceeding the leaves; umbels 10–21-rayed, the fruiting rays spreading, sometimes reflexed, subequal, 4–43 mm. long; involucel bracts several, linear, acute, subscarious, longer than the pedicels; umbellets 10–25-flowered, the fertile flowers 1–5, the flowers yellow, the fruiting pedicels 0.5–5 mm. long; fruit linear-oblong, 9–12 mm. long, about 4 mm. broad, mostly reflexed, the wings narrower than the body, the oil tubes 1–4 (usually 3) in the intervals, 6–7 on the commissure.

TYPE: *Brandegee 799*, Walla Walla region, Washington, May 1883.

DISTRIBUTION: Rocky slopes, 3000 to 6500 feet, Chelan, Okanogan and Kittitas counties, Washington.

TYPICAL SPECIMENS: WASHINGTON: dry open slopes below Stuart Pass, Chelan Co., *Thompson 7728* (M, NY, UC, US); yellow pine slopes of Tronson Ridge, Chelan Co., *Thompson 9310* (M, NY, Po, UC).

63. Lomatium nudicaule (Pursh) Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 238. 1900.

Smyrnium nudicaule Pursh, Fl. 1: 196. 1814.

Ferula nudicaulis Nutt. Gen. 1: 182. 1818.

Pastinaca nudicaulis (Pursh) Spreng. ex Linn. Syst. Veg. ed. Roem. & Schult. 6: 587. 1820.

Ferula Nuttallii DC. Prodr. **4**: 174. 1830.
Seseli leiocarpum Hook. Fl. Bor.-Am. **1**: 263. 1834.
Peucedanum latifolium Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 625. 1840, not DC. (1830).
P. leiocarpum Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 626. 1840.
P. leiocarpum Nutt. var. *compestre* Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 626. 1840.
P. nudicaule Nutt. ex Torr. & Gray, Fl. N. Am. **1**: 627. 1840, not of later authors.
P. Nuttallii Wats. Bot. King Exp. 128. 1871, not *Seseli Nuttallii* Gray (1870).
P. triternatum acc. to Gray, Proc. Am. Acad. **8**: 385. 1873, not Nutt. (1840).
P. robustum Jepson, Erythea **1**: 9. 1893.
Lomatium platyphyllum Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 238. 1900.
Cogswellia nudicaulis (Pursh) Jones, Contr. Western Bot. **12**: 31. 1908.
C. latifolia (Nutt.) Jones, Contr. Western Bot. **12**: 31. 1908.
C. platyphylla Coult. & Rose, Contr. U. S. Nat. Herb. **12**: 450. 1909.

Plants acaulescent, rarely with 1 stem leaf, 2.5–7 dm. tall, glabrous, from a long thickened tap-root; leaves broadly ovate, the blades 9–18 cm. long, 1–2-ternate, then pinnate, the leaflets distinct, lanceolate to broadly ovate, entire or toothed and lobed at the apex, 1.5–9 cm. long, 0.5–4 cm. broad, the petioles 4–25 cm. long, sheathing to above the middle; peduncles exceeding the leaves, swollen at the apex; umbels 10–20-rayed, the rays 1–20 cm. long, ascending, usually all fertile, somewhat swollen at the apex; involucel absent; umbellets many-flowered, the flowers yellow, mostly fertile, the fruiting pedicels 3–15 mm. long; fruit oblong, 10–14 mm. long, 3–5 mm. broad, the wings narrower than the body, the oil tubes solitary in the dorsal intervals, 1–several in the lateral intervals, 4–7 on the commissure.

The Indians eat the tops of the plant and boil it in their soups.

TYPE: *Lewis*, on the Columbia River (Rock Fort Camp, at The Dalles), Washington (Ph).

DISTRIBUTION: Alberta and British Columbia to central California, east to Idaho and western Utah.

TYPICAL SPECIMENS: WASHINGTON: Wenatchee Mts., Kittitas Co., *Elmer 475* (NY, Po, US); Peshastin, Okanogan Co., *Sandberg & Leiberg 487* (NY, UC, US); Leavenworth, Chelan Co., *Thompson 8455* (M, NY, Po, UC). CALIFORNIA: Genesee Valley, Plumas Co., *Hall & Babcock 4441* (M, UC, US); near Marston Station, Plumas Co., *Heller 10834* (NY, UC, US); Yreka, Siskiyou Co., *Butler 1363* (Po, UC, US).

The Nuttall type of *Peucedanum leiocarpum* has pedicels mostly longer than the fruit, oil tubes solitary in the intervals, and linear-lanceolate leaflets. The Nuttall type of *P. latifolium* has pedicels shorter than the fruit, oil tubes several in the intervals, and ovate to suborbicular leaflets. However, in the numerous specimens examined the character of short pedicels is combined with linear leaflets, and the oil-tube number is variable. Because these various forms inhabit the same range it is possible that they represent a hybrid mixture of two formerly distinct species and the hybrid generations have become dominant in the region. In every case, however, the inflated peduncle is a constant and easily discernible character setting this species off from all others in the genus.

EXCLUDED SPECIES

Cogswellia duchesnensis Jones, acc. to Gray Card Index, in err. = **Cymopterus duchesnensis** Jones, Contr. Western Bot. **13**: 12. 1910.

Cogswellia lapidosa (Jones) Rydb. Fl. Rocky Mts. 627. 1917 = **Cymopterus longipes** Wats. Bot. King Exp. 124. 1871.

Cogswellia Lemmoni (Coult. & Rose) Jones, Contr. Western Bot. **12**: 33. 1908 = **Pseudocymopterus montanus** (Gray) Coult. & Rose, Rev. N. Am. Umbell. 74. 1888.

Cynomarathrum Macbridei A. Nels. Bot. Gaz. **54**: 142. 1912 = **Pseudocymopterus humboldtensis** (Jones) Mathias, Ann. Mo. Bot. Gard. **17**: 325. 1930, ex char.

Lomatium lapidosum (Jones) Garrett, Spring Fl. Wasatch Reg. 110. 1927 = **Cymopterus longipes** Wats. Bot. King Exp. 124. 1871.

Lomatium Lemmoni Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 213. 1900 = **Pseudocymopterus montanus** (Gray) Coult. & Rose, Rev. N. Am. Umbell. 74. 1888.

Peucedanum lapidosum Jones, Zoe **2**: 246. 1891 = **Cymopterus longipes** Wats. Bot. King Exp. 124. 1871.

Peucedanum Lemmoni Coult. & Rose, Bot. Gaz. **14**: 277. 1889 = **Pseudocymopterus montanus** (Gray) Coult. & Rose, Rev. N. Am. Umbell. 74. 1888.

Peucedanum ludovicianum Raf. ex Torr. & Gray, Fl. N. Am. **1**: 629. 1840, nom. nud. = **Oxypolis** sp.

Peucedanum Newberryi Wats. Am. Nat. **7**: 301. 1873 = **Cymopterus Newberryi** (Wats.) Jones, Zoe **4**: 47. 1893.

Peucedanum rigidius (L.) Baill. Hist. **7**: 187. 1880 = **Oxypolis rigidior** (L.) Raf. Neogenyt. **2**: 1825; Sér. Bull. Bot. **1**: 218. 1830.

Peucedanum salmoniflorum Coult. & Rose, ex Holzinger, Contr. U. S. Nat. Herb. **3**: 228. 1895 = **Leptotaenia salmoniflora** Coult. & Rose, Contr. U. S. Nat. Herb. **7**: 201. 1900.

Peucedanum ternatum Nutt. Gen. **1**: 182. 1818 = **Oxypolis ternata** (Nutt.) Heller, Cat. N. Am. Pl. 5. 1898.

INDEX TO SPECIES AND GENERA

Accepted names are in Roman type; synonyms are in *italics;* new species and new combinations are in **bold-face** type; the page number on which the description appears is in **bold-face** type.

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STUDIES IN THEACEAE. III

EURYA SUBGENERA EURYODES AND PENTEURYA

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The genus *Eurya* was first described by Thunberg[1] in 1783 with *E. japonica*, the type-species. By 1854, over forty species had been added to this genus by various workers. During this year, A. Gray[2] described three new species from the Pacific Islands and established a subgenus Euryodes for two of his species, *E. Pickeringii* and *E. Richii*. Pentandrous staminate flowers formed the basis for this segregation.

In 1893, Szyszylowicz[3] recognized three sections: Cleyera, Freziera and Proteurya. In his study he had enlarged the scope of the genus by including two other genera, *Cleyera* Thunberg and *Freziera* Swartz. Also he instituted the new section Proteurya under which he placed the subgenus Euryodes A. Gray.

Two years later (1895), Vesque,[4] overlooking Szyszylowicz' treatment, proposed four sections: Eueurya, Euryodes, Gynandra and Meristotheca. The last two mentioned were designated as new. Proteurya was included under Eueurya. To my knowledge this was the first time that the name Eueurya had been used as a divisional name for this genus. Vesque's key and sections were based on anatomical characters and proved impracticable; hence they have been little used.

In 1896, Urban[5] established a new genus, *Ternstroemiopsis* with *Eurya sandwicensis* A. Gray as the type. At the same

[1] Thunberg, Nov. Gen. Pl. 68 (1783).
[2] A. Gray, Bot. U. S. Expl. Exped. 1838–1842, 1: 211(1854).
[3] Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. 6: 189(1893).
[4] Vesque in Bull. Soc. Bot. France, 42: 151(1895).
[5] Urban in Ber. Deutsch. Bot. Gesell. 14: 49(1896).

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time he treated *Freziera, Cleyera* and *Eurya* as separate genera.

The following year (1897), Engler[6] studied the genus *Eurya* and subdivided it into the following subgeneric heads: Cleyera, Freziera, Proteurya and Ternstroemiopsis. Again A. Gray's subgenus was included in Proteurya.

In 1935, the present author,[7] in the first of a series of studies in the Theaceae, presented a synopsis of the subgenus Ternstroemiopsis and recognized one other subgenus, Proteurya. *Cleyera*[8] and *Freziera* were excluded as distinct genera. Since that time, after studying the remaining species of *Eurya,* I feel that three subgenera should be recognized, namely, Ternstroemiopsis, Euryodes (Proteurya) and a new subgenus Penteurya. This study brought out the fact that the divisional name Euryodes (1854) antedates the name Proteurya (1893). Since the time of Vesque most workers have felt that Gray's basis of separation, that of pentandrous staminate flowers, was insufficient to separate it from Proteurya. Gray, having only staminate specimens, could not know that the pistillate specimens would agree with the other then-known species of *Eurya* by having three-parted styles and stigmas. In merging these two subdivisions under the same heading the name Euryodes, because of its priority, must be used since the International Rules stipulate that the first divisional name established must be accepted.

In working over the New Guinean material I was surprised to find species having both pentandrous stamens and five-parted styles and stigmas. As far as I know, with the exception of two, all New Guinean species belong to this new subgenus described below.

The fact that the genus is dioecious makes the presentation of a natural key very difficult. Instead, an artificial key has been prepared. Except in a very few instances, the species are confined to distinct geographical regions. Therefore, it has

[6] Engler in Engler & Prantl, Nat. Pflanzenfam. Nachtr. 1: 246(1897).
[7] Kobuski in Jour. Arnold Arb. 16: 347(1935).
[8] Kobuski in Jour. Arnold Arb. 18: 118(1937).

been considered advisable to separate the genus into five geographical groups and prepare an individual key for each group.

To make this study possible borrowed material, photographs and fragments of types were obtained from many European and Oriental herbaria as well as American institutions. In a few instances reference is made to some of these institutions by abbreviations accompanying the citation of critical specimens. These are as follows: AA = Arnold Arboretum, BM = British Museum, FM = Field Museum, G = Gray Herbarium, NY = New York, SY = Sun Yatsen, V = Vienna. Professor Alfred Rehder, Curator of the Herbarium of the Arnold Arboretum, while visiting European herbaria diligently searched for many obscure types and specimens, photographed them and procured fragments when possible. His carefully prepared notes concerning the types have been most helpful. Dr. E. D. Merrill, Director of the Arnold Arboretum, has also displayed a keen interest and has offered constructive criticism in the development of this study. To all assisting in this work, I am deeply grateful.

This paper is affectionately dedicated to Dr. Jesse More Greenman, for years my professor, advisor and friend.

KEY TO THE SUBGENERA

Folia spiraliter disposita; petala carnosa; antherae filamentis duplo longiores .....1. TERNSTROEMIOPSIS[1]

Folia plus minusve disticha; petala plus minusve membranacea; antherae filamentis plerumque breviores.

Stylus tri-partitus, interdum quadri-partitus; stamina 5, 10 vel 15...2. EURYODES

Stylus quinque-partitus; stamina 5.....3. PENTEURYA, subgen. nov.

KEY TO THE SPECIES OF CHINA, INDO-CHINA, INDIA AND CEYLON

A. Terminal leaf-buds and young branchlets glabrous.

B. Leaves sessile; base auriculate with lobes clasping the stem.....1. *E. amplexifolia*

BB. Leaves petiolate; base entire.

C. Young branchlets terete.

D. Leaves entire or nearly so.*

E. Leaves tapering to an acuminate apex.....2. *E. Macartneyi*

* *E. Macartneyi* occasionally with some leaf serration.

[1] Kobuski in Jour. Arnold Arb. 16: 347 (1935).

EE. Leaves bluntly obtuse at the apex.....12a. *E. cuneata* var. *glabra*
DD. Leaves sharply serrate.....2a. *E. Macartneyi* var. *hainanensis*
CC. Young branchlets angled.
F. Branchlets four-angled.
G. Leaves up to 25 cm. long, 6 cm. wide; veins, 20 or more pair, deeply impressed on upper surface, highly raised (even to cross veins) on lower surface; style 5–6 mm. long.....3. *E. polyneura*
GG. Leaves up to 10–11 cm. long, ca. 3 cm. wide; veins raised on upper surface, inconspicuous; style short (1 mm. long).....4. *E. tetragonoclada*
FF. Branchlets two-angled.
H. Leaves narrow, usually 0.5–0.8 cm. wide, occasionally up to 1 cm. wide; fruit oblong.....5. *E. stenophylla*
HH. Leaves usually much wider (occasionally only 1.7 cm. wide in *E. Handeliana*); fruit globose.
I. Veins on upper surface deeply impressed, as if etched.....6. *E. Handeliana*
II. Veins on upper surface raised or inconspicuous, never impressed.
J. Leaves tapering at both ends, oblong.....7. *E. nitida*
JJ. Leaves rounded at base, obtusely acuminate, wider because of rounded base.....7a. *E. nitida* var. *aurescens*
AA. Terminal leaf-buds and young branchlets pubescent.
K. Ovary and fruit glabrous.
L. Leaf-base oblique or lobed.
M. Leaves 8–10 cm. long, membranaceous, long-attenuate at apex, margins flat, not revolute.....8. *E. obliquifolia*
MM. Leaves 4–6 cm. long, coriaceous, apex blunt occasionally, shortly acuminate, margins revolute.....9. *E. glandulosa*
LL. Leaf-base cuneate, occasionally somewhat rounded, never lobed or oblique.
N. Leaves rounded at apex, emarginate, never acuminate.....10. *E. emarginata*
NN. Leaves acuminate at apex.
O. Margins entire, occasionally slightly undulate, never sharply serrate.....11. *E. cuneata*
OO. Margins sharply serrate, never entire.
P. Leaves (majority) small, less than 4 cm. long.
Q. Leaves evenly elliptic-acuminate; veins deeply impressed on upper surface.....12. *E. Fangii*
QQ. Leaves obovate, quite obtuse at apex, sometimes nearly rounded; veins upraised or nearly insignificant on upper surface.....13. *E. chinensis*
PP. Leaves considerably longer, 6–12 cm. long.
R. Leaves thick, coriaceous; margins revolute.....14. *E. ceylanica*
RR. Leaves membranaceous or nearly membranaceous;* margins not revolute.

* In case of *E. symplocina*, the older leaves are occasionally quite coriaceous.

S. Calyx pubescent; terminal leaf-bud and young branchlets pilose.
T. Leaves narrowly lance-acuminate, usually three times as long as wide; veins not especially conspicuous on upper surface.....15. *E. acuminata*
TT. Leaves wide-lanceolate, up to 4 cm. wide, veins conspicuously depressed on upper surface.....16. *E. cerasifolia*
SS. Calyx glabrous; terminal leaf-bud and young branchlets minutely puberulent, sometimes appearing glabrous.....17. *E. Loquaiana*
KK. Ovary and fruit pubescent.
U. Leaves auriculate at base, clasping stem.....18. *E. disticha*
UU. Leaves cuneate or rounded at base, not auriculate or clasping.
V. Calyx glabrous.
W. Fruit becoming glabrescent at maturity with only occasional hairs present; leaves delicately tapering at both ends; terminal bud finely puberulent, at times appearing almost glabrous.....19. *E. trichocarpa*
WW. Fruit pubescent at maturity, leaves although tapering somewhat, nearly rounded at base; terminal bud pilose.....21a. *E. distichophylla* var. *Henryi*
VV. Calyx pubescent.
X. Leaves huge, 10–14 cm. long, 5 cm. wide.....20. *E. velutina*
XX. Leaves up to 10 cm. long, narrow-lanceolate, seldom over 2 cm. wide.
Y. Calyx obtuse, with short pilose hairs; styles trifid.....21. *E. distichophylla*
YY. Calyx acuminate, densely covered with long yellow hairs; styles usually 4-fid.....22. *E. ciliata*

KEY TO THE SPECIES OF JAPAN, KOREA, FORMOSA AND LIU KIU ISLANDS

A. Pubescent ovary and fruit.
B. Leaves narrow lanceolate, up to 14 cm. long; strigillose-pubescent on stems as well as fruit.....23. *E. strigillosa* (Formosa)
BB. Leaves ovate-elliptic, up to 7 cm. long; stem glabrous or nearly so, not strigillose.....24. *E. gnaphalocarpa* (Formosa)
AA. Glabrous ovary and fruit.
C. Largest leaves less than 4 cm. long, usually 2–3 cm. or less.
D. Leaves membranaceous, 2–3 cm. rarely 4 cm. long.....25. *E. leptophylla* (Formosa)
DD. Leaves coriaceous, minute, usually less than 1 cm. long, occasionally 2 cm. long.
E. Leaves about as broad as long, less than 0.5 cm. either way, seemingly entire, deeply emarginate, obcordate.....11a. *E. emarginata* var. *microphylla* (Japan)

EE. Leaves longer than broad, although small, leaves always found up to 1.5–2.0 cm. long, serrate, never obcordate in shape.
F. Leaves acute at apex, elliptic.....26. *E. crenatifolia* (Formosa)
FF. Leaves obtuse at apex, obovate.....
.....31a. *E. japonica* var. *microphylla* (Japan)
CC. Largest leaves up to 11–12 cm. long, all considerably longer than 4 cm.
G. Entirely glabrous even to terminal bud.
H. Branches winged, stem growth zigzag from node to node.
I. Twenty stamens, filaments twice as long as anthers.....
.....27. *E. yaeyamensis* (Liu Kiu)
II. Ten stamens, anthers twice as long as filaments.....
.....28. *E. zigzag* (Liu Kiu)
HH. Branches perhaps slightly winged, zigzag growth absent.
J. Leaves sharply toothed, evenly elliptic..29. *E. glaberrima* (Formosa)
JJ. Leaves nearly entire or undulate-serrate, never sharply toothed.
K. Leaves nearly entire, very slight serration.....
.....30. *E. Hayatai* (Formosa)
KK. Leaves always undulate-serrate, usually more noticeable at apex.....31. *E. japonica* (Japan)
GG. Pubescence found on stem as well as terminal buds.
L. Leaves acuminate, attenuate at apex.
M. Leaves 3.5 cm. wide, robust.....32. *E. rengechiensis* (Formosa)
MM. Leaves less than 2 cm. wide at broadest part.....15. *E. acuminata*
LL. Leaves obtuse at apex.
N. Leaves heavy-coriaceous, perfectly obovate, rounded at apex, never acuminate, distinctly emarginate, slightly serrate.....
.....10. *E. emarginata*
NN. Leaves coriaceous, sometimes obovate, always acuminate, usually not emarginate, distinctly serrate.....13. *E. chinensis*

KEY TO THE SPECIES OF THE PHILIPPINE ISLANDS

A. Leaves auriculate (heart-shaped) at base, sessile, clasping the stem.....
.....33. *E. amplexicaulis*
AA. Leaves cuneate at base, petioled.
B. Terminal buds pubescent.
C. Pubescent ovary and young fruit.
D. Leaves ovate-elliptic, acute apex not attenuate; fruit pubescent at maturity.....24. *E. gnaphalocarpa*
DD. Leaves long attenuate; fruit glabrescent at maturity..19. *E. trichocarpa*
CC. Glabrous ovary and fruit.
E. Leaves very short-petiolate, nearly sessile; branches terete.....
.....34. *E. buxifolia*
EE. Leaves petioled 2–3 mm. long; young branches angled.....35. *E. flava*
BB. Terminal buds glabrous.
F. Styles partially connate, 2–2.5 mm. long.....7. *E. nitida*
FF. Styles free to base, very short, 1 mm. or less.....36. *E. coriacea*

KEY TO THE SPECIES OF THE DUTCH EAST INDIES, SAMOA AND FIJI ISLANDS

A. Staminate flowers pentandrous.
B. Entirely glabrous....37. *E. Pickeringii*
BB. Pubescent terminal buds and young branchlets....38. *E. Richii*
AA. Staminate flowers decandrous or polyandrous.
C. Ovary and young fruit pubescent....19. *E. trichocarpa*
CC. Ovary and young fruit glabrous.
D. Terminal buds and branchlets pubescent.
E. Leaf serration rounded-undulate (Fiji)....39. *E. vitiensis*
EE. Leaf serration sharp (Dutch E. Indies)....15. *E. acuminata*
DD. Terminal buds and branchlets glabrous.
F. Young branchlets terete....40. *E. glabra*
FF. Young branchlets angled.
G. Flower buds and fruit conical in shape....41. *E. coneocarpa*
GG. Flower buds and fruit globose, not conical.
H. Persistent style 2–3 mm. long, connate nearly its whole length ....7. *E. nitida*
HH. Persistent style hardly 1 mm. long, free nearly to base.
I. Leaves obtuse at apex, bluntly acuminate....42. *E. obovata*
II. Leaves oblong-elliptic, tapering-acuminate, not obtuse at apex ....42a. *E. obovata* var. *sinaboengensis*

KEY TO THE SPECIES OF NEW GUINEA

A. Style and stigma three-parted. [Subgenus EURYODES.]
B. Branches glabrous; leaves 10–15 cm. long, 4–5 cm. wide....43. *E. Roemeri*
BB. Branches clothed with dense fulvous, appressed pilose pubescence; leaves 2–3 cm. long, 0.7–1.0 cm. wide....44. *E. Greenmaniana*
AA. Style and stigma five-parted. [Subgenus PENTEURYA.]
C. Leaves obtuse at apex, not acuminate.
D. Leaves 3 cm. or less long.
E. Branchlets sparingly pubescent; leaves cuneate or subrotund at base, not cordate....45. *E. Hellwigii*
EE. Branchlets densely pilose or tomentose; leaves cordate..46. *E. albiflora*
DD. Leaves approximately 6 cm. long....47. *E. Merrilliana*
CC. Leaves acuminate at apex.
F. Leaves membranaceous, not coriaceous; pilose, at least when young.
G. Leaves rounded at base....48. *E. tigang*
GG. Leaves cuneate at base.
H. Leaves 10–13 cm. long....49. *E. meizophylla*
HH. Leaves 4–5 cm. long....50. *E. leptantha*
FF. Leaves coriaceous; glabrous (except in case of *E. phyllopoda*).
I. Leaves serrate at acuminate apex only....51. *E. Rehderiana*
II. Leaves serrate along complete margin.
J. Terminal buds glabrous....52. *E. oxysepala*
JJ. Terminal buds closely silky-strigose....53. *E. phyllopoda*

Subgenus Euryodes

Eurya subgenus **Euryodes** A. Gray, Bot. U. S. Explor. Exped. 1838–1842, **1**: 211(1854).

Eurya section *Proteurya* Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893).

Eurya section *Eueurya* Vesque in Bull. Soc. Bot. France, **42**: 151(1895).

Eurya subgenus *Proteurya* (Szyszylowicz) Engler in Engler & Prantl, Nat. Pflanzenfam. Nachtr. **1**: 247(1897).

1. **Eurya amplexifolia** Dunn in Kew Bull. Misc. Inform. Add. Ser. **10**: 44 (Fl. Kwangtung) (1912).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Distribution: China (Kwangtung).

China. kwangtung: on slope along road, *N. K. Chun 42586*, Apr. 5–May 1, 1931; *F. A. McClure 415; J. L. Gressitt 1745; W. T. Tsang 21037, 21116, 21218, 21660.*

This species is characterized by its large (16 cm. × 5 cm.) amplexicaul leaves. The two auriculate basal lobes extend as much as 1.0–1.5 cm. beyond and often overlap the other side of the stem. The younger branchlets are two-winged, glabrous even to the terminal bud. The fruit is oblong-ovate (7 mm. × 4 mm.) with a short style (less than 1 mm.) which is connate most its length.

2. **Eurya Macartneyi** Champion in Proc. Linn. Soc. London, **2**: 99(1850).—Bentham in Hooker's Jour. Bot. Kew Misc. **2**: 307(1851).—Mueller in Walpers, Ann. Bot. Syst. **4**: 347(1857).—Seemann, Bot. Voy. Herald, 366, t. 74(1857).—Bentham, Fl. Hongkong. 28(1861).—Champion in Trans. Linn. Soc. London, **21**: 113(1873).—Hemsley in Jour. Linn. Soc. Bot. **23**: 77(1886).—Dunn & Tutcher in Kew Bull. Misc. Inform. Add. Ser. **10**: 43 (Fl. Kwangtung & Hongkong) (1912).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Distribution: China (Kwangtung, Hainan, Kwangsi).

China. kwangtung: *Lord G. Macartney, s.n.* (type in BM; photo. and fragment, AA); *C. Ford s.n.; C. Wright s.n.; C. S. Sargent s.n.; C. Wilford s.n.; H. Fenzel 31; H. Green 1183; Y. Tsiang 1282; W. T. Tsang 16677, 20090; W. Y. Chun 5813, 5920, 5935, 7546; L. Gibbs 7428; S. K. Lau 2732, 24090, 24740, 24944; C. L.*

Tso 20174, 20325, 20904, 22686; Z. S. Chung 11097; L. Yiu 10603; D. H. King 9856; C. Wang & H. Y. Liang 31272, 31279; C. Wang 31643; N. K. Chun 40890, 41392, 41782, 41786, 41907, 42032, 42037; H. Y. Liang 60501, 61018, 61241, 61242; S. P. Kwok 80043, 80064.—HAINAN: *H. Y. Liang 63300, 63740, 63841.*—KWANGSI: *R. C. Ching 8008, 8242; W. T. Tsang 22737.*

In most species of *Eurya,* one finds winged branchlets accompanying strictly glabrous terminal buds. *Eurya Macartneyi* is one of the few exceptions to this group, having terete branchlets with glabrous terminal buds. The branchlets are sturdy, as are the leaves, petioles and flower buds. The large leaves have pronounced veining on the upper surface, revolute margins and slight serration if any. The fruit is globose while the attached style is approximately 1 mm. long and free its entire length.

2a. **Eurya Macartneyi** Champion var. **hainanensis,** var. nov. A typo recedit foliis latioribus, acutius serratis, acuminatis.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: in forest, Mo San Ling, alt. 900 m., *N. K. Chun & C. L. Tso 44361* (type, AA), Nov. 24, 1932 (tree 6 m. with gray bark; leaves coriaceous, deep green, glabrous; fruit purple); *N. K. Chun & C. L. Tso 44300; F. C. How 72119, 72156, 72628, 73496, 73575; H. Y. Liang 64341, 64698, 64700; C. Wang 34610, 35094, 35537, 36022, 36091, 36247.*

This variety can be distinguished from the species by its wider, acuminate and sharply serrate leaves which, although coriaceous, are not as thick as those of the species.

3. **Eurya polyneura** Chun in Sunyatsenia, **2**: 55, pl. 16 (1934); in Hu & Chun, Icon Pl. Sin. **5**: 7, pl. 207 (1937).

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: side of ravine, Taimo Shan, Sunyi Terr., *S. P. Ko 51272* (isotype, AA), Nov. 4, 1931 (shrub 4 m. tall; leaves deep green above, pale green below); *C. Wang 31040, 37884, 38016, 31980.*

As the name signifies, the outstanding character of this species is the veining. The leaves are large, oblong-lanceolate, 15–25 cm. long, 4–6 cm. wide. The principal lateral veins, impressed on the upper surface, are strongly elevated on the lower surface. There are 25 or more to each side of the midrib and,

being joined nearly at right angles to the midrib, present a scalariform appearance. These veins anastomose near the margin. Besides this character, the branches are stout, angular and ridged; the fruit is oblong-ovoid, 11 mm. long, 5 mm. wide, glabrous. The persistent style is about 5 mm. long and connate for most its length. The ♂ flowers have not been seen.

4. **Eurya tetragonoclada** Merrill & Chun in Sunyatsenia, 1: 71(1930).—Chun in Hu & Chun, Icon. Pl. Sin. 5: 8, pl. 208(1937).

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: in woods, Kow Fung, Lok Chong District, *C. L. Tso 20683* (isotype, AA), May 20, 1929; *H. Y. Liang 61265; S. P. Ko 51150.*

Because of its sharply 4-angled branchlets this species is immediately associated with *E. polyneura* which is distinctive for the same character. They can be easily separated by the style and leaf venation. This species has a comparatively short, stout style (1 mm.) while *E. polyneura* has a style of 5–6 mm. Also the leaf-veining in *E. tetragonoclada* is rather inconspicuous while in *E. polyneura* there are more than twenty pair. These, in turn, are sharply raised on the lower leaf-surface.

5. **Eurya stenophylla** Merrill in Philipp. Jour. Sci. 21: 502(1922); in Univ. Calif. Publ. Bot. 13: 136(1926).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 21: 148(1925).

DISTRIBUTION: China (Kwangtung, Kwangsi), Indo-China, India (Burma).

CHINA. KWANGTUNG: Tung Sing, *K. K. Ts'oong 1940* (type, NY), June 28, 1918.—KWANGSI: *W. T. Tsang 22373, 22668, 22757; R. C. Ching 6138, 7835, 8071; A. N. Steward & H. C. Cheo 977.*

INDO-CHINA: *A. Petelot 1802, 3948.*

INDIA: *F. K. Ward 9087.*

This is one of the strictly glabrous species, glabrous even to the terminal bud. As in the majority of these glabrous species, the branchlets are narrowly winged. The fruit is oblong-ovoid (7–8 mm. × 4.0 mm) rather than globose. The pedicel on the fruit is comparatively long as is the persistent style (up to 5 mm.). The leaves are narrow, sometimes only 0.5 cm. wide, while 4 cm. long.

6. **Eurya Handeliana**, spec. nov.

Eurya aurescens sensu Handel-Mazzetti, Symb. Sin. 7: 400(1931), quoad descript. excl. syn.; non *Eurya japonica* Thunberg var. *aurescens* Rehder & Wilson.

Frutex glaber 1.0–2.5 m. altus, ramis verruculosis; foliis coriaceis oblongo-ellipticis vel obovatis 3.5–6.0 cm. longis et 1.0–2.2 cm. latis obtuse acuminatis emarginatis basi cuneatis supra viridibus subtus luteo-viridibus margine serratis revolutis, venis supra profunde impressis reticulatis, petiolo 2 mm. longo; floribus axillaribus singularibus vel binis; florum ♂ pedicellis 2 mm. longis, bracteis 2 obovatis parvis, sepalis 5 imbricatis viridibus obovatis 2 mm. longis et 1.5 mm. latis, petalis 5 obovatis 3.5–4.0 mm. longis et 2.5–3.0 mm. latis, staminibus 5, filamentis 2 mm. longis, antheris 1 mm. longis, ovariis rudimentariis; florum ♀ pedicellis 1.5–2.0 mm. longis, bracteis 2 minutis obtusis, sepalis 5 obovatis 2.5–3.0 mm. longis et 1.8–2.0 mm. latis, ovariis globosis 1.0–1.5 mm. latis, stylis 3 ad basin liberis; fructibus globosis 3.5 mm. latis.

DISTRIBUTION: China (Yunnan), India (Burma).

CHINA. YUNNAN: exact locality and date lacking, *G. Forrest 15692* (type, AA); *G. Forrest 8922, 8940, 11944, 17519, 21537; Y. Tsiang 13157; H. Handel-Mazzetti 8724; C. Schneider 2488, 2798; J. F. Rock 3157, 8066.*

BURMA: *J. F. Rock 7406.*

Handel-Mazzetti, in working over material of Yunnan, encountered material from this species *(E. Handeliana)* and, interpreting it as *E. japonica* var. *aurescens* Rehder & Wilson, thought it sufficiently distinctive to be worthy of specific rank and called it *E. aurescens* (R. & W.) Handel-Mazzetti.

In the present paper, *E. japonica* var. *aurescens* is found to be more closely allied to *E. nitida* Korthals than to *E. japonica* Thunberg and has been transferred to *E. nitida* as *E. nitida* var. *aurescens* (R. & W.). According to the "International Rules" the name *"aurescens"* must be retained for material of the Rehder & Wilson concept and a new name must be given to this species. No name could be more fitting than that of Handel-Mazzetti himself, a renowned worker on Chinese botany, and it is a great pleasure to dedicate this species to him.

The truly remarkable feature of this species is the pronounced veining on the upper surface of the leaf. The veins, all, even including the small cross-veins, are deeply impressed giving the effect of etching. Students other than Handel-Mazzetti have been misled by the light yellow under-surface of the leaf and have interpreted the material as belonging to the present *E. nitida* var. *aurescens*. The calyx lobes in both the male and female flowers are bluish-green, at least in the herbarium specimens. Also the stamen number is five, while the style is three-parted.

7. **Eurya nitida** Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 115, t. 17 (1840).—Walpers, Repert. Bot. Syst. **1**: 369(1842).—Choisy in Zollinger, Syst. Verz. Ind. Archip. 147(1854).—Blume, Mus. Bot. Lugd.-Bat. **2**: 111(1856).—Miquel, Fl. Nederl. Ind. 1^2: 472(1859); in Ann. Mus. Bot. Lugd.-Bat. **4**: 105(1868–69).—Merrill in Jour. Str. Br. Roy. As. Soc. (Spec. No.) 391(1921).—Handel-Mazzetti, Symb. Sin. 7^1: 399(1931).—Chun in Sunyatsenia, **2**: 59(1934).—Rehder in Jour. Arnold Arb. **15**: 99(1934).

Eurya Roxburghii Wallich, Num. List, No. 1465 (1828), pro parte.—Blume, Mus. Bot. Lugd.-Bat. **2**: 113(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 344(1857).

Eurya Wightiana Wallich, Num. List, No. 3662 (1829), *nomen nudum*.

Eurya fasciculata Wallich, Num. List. No. 4399 (1830), *nomen nudum*.—Vesque in Bull. Soc. Bot. France, **42**: 153(1895).

Eurya Zollingeri Choisy in Zollinger, Syst. Verz. Ind. Archip. 143, 147 (1854).—Mueller in Walpers, Ann. Bot. Syst. **4**: 347(1857).—Miquel, Fl. Nederl. Ind. 1^2: 471(1859).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 248(1896).

Eurya anceps Blume, Mus. Bot. Lugd.-Bat. **2**: 111(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 344(1857).—Miquel, Fl. Nederl. Ind. 1^2: 472(1859).

Eurya myrtifolia Blume, Mus. Bot. Lugd.-Bat. **2**: 113(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 344(1857).—Miquel, Fl. Nederl. Ind. 1^2: 473(1859).—Vesque in Bull. Soc. Bot. France, **42**: 156(1895).

Eurya myrtifolia Blume var. *polymorpha* Blume, Mus. Bot. Lugd.-Bat. **2**: 113(1856).

Eurya Hasseltii Blume, Mus. Bot. Lugd.-Bat. **2**: 112(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 344(1857).—Miquel, Fl. Nederl. Ind. 1^2: 473(1859).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 244(1896).

Eurya virens Blume, Mus. Bot. Lugd.-Bat. **2**: 112(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 344(1857).—Miquel, Fl. Nederl. Ind. 1^2: 473(1859); Sumatra, 477(1862).

Eurya virens Blume var. *β. elliptica* Miquel, Sumatra, 477(1862).

Eurya japonica Thunberg var. *α. Thunbergii* Thwaites, Enum. Pl. Zeyl. 41(1864).

Eurya japonica Thunberg var. *nitida* Thiselton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 284(1874).—Pierre, Fl. For. Cochinch. **2**: t. 126(1887).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 235(1896).—Pitard in Lecomte, Fl. Gén. Indo-Chine, **1**: 338(1910).—Rehder & Wilson in Sargent, Pl. Wilson. **2**: 398(1915).—Diels in Bot. Jahrb. **56**: 526(1921).—Rehder & Wilson in Jour. Arnold Arb. **8**: 177(1927).—Kanehira in Bot. Mag. Tokyo, **45**: 329(1931).

Eurya systyla Miquel ex Thiselton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 284 (1874), pro synon.

Eurya myrtifolia Blume var. *α. anceps* (Blume) Vesque in Bull. Soc. Bot. France, **42**: 156(1895).

Eurya myrtifolia Blume var. *γ. virens* (Blume) Vesque in Bull. Soc. Bot. France **42**: 157(1895).

Eurya myrtifolia Blume var. *δ. Hasseltii* (Blume) Vesque in Bull. Soc. Bot. France, **42**: 157(1895).

Eapanea aurea Léveillé in Fedde, Rep. Spec. Nov. **10**: 376(1912); Fl. Kouy-Tchéou, 288(1914).

Eurya ladronica Hosakawa in Jour. Soc. Trop. Agric. **6**: 667(1934), *nomen nudum;* in Trans. Nat. Hist. Soc. Formosa, **25**: 30(1935).—Kanehira in Jour. Dept. Agric. Kyushu Imper. Univ. **4**: 370 (Enum. Micronesian Pl.) (1935).

Eurya palauensis Hosakawa in Trans. Nat. Hist. Soc. Formosa, **25**: 31(1935). —Kanehira in Jour. Dept. Agric. Kyushu Imper. Univ. **4**: 370 (Enum. Micronesian Pl.) (1935).

Eurya ponapensis Hosakawa in Trans. Nat. Hist. Soc. Formosa, **25**: 32(1935). —Kanehira in Jour. Dept. Agric. Kyushu Imper. Univ. **4**: 370 (Enum. Micronesian Pl.) (1935).

DISTRIBUTION: Dutch East Indies (Java, Sumatra, Borneo), Caroline and Marianne Islands, Philippine Islands (Palawan, Mindoro), Indo-China, India, China (Kwangtung, Hainan, Anhwei, Chekiang, Fukien, Hupeh, Kiangsu, Kwangsi, Kweichow, Szechuan, Yunnan).

BORNEO: locality and collector lacking (isotype of *E. nitida*, G, NY); *native collector 133, 870, 1878, 2685; J. & M. S. Clemens 20526, 20658, 20902; H. Hallier B764.*

JAVA: localities and collectors lacking (photos. and fragments of types of *E. Hasseltii, E. myrtifolia* and *E. anceps*, AA; isotypes of *E. anceps*, G, NY); *H. Zollinger 2119* (isotype of *E. Zollingeri*, FM).

SUMATRA: prope Pandan-dulu-enim, Prov. Palembang, *J. E. Teysmann* (isotype of *E. virens*, G); Bangka, *J. E. Teysmann* (isotype of *E. virens* var. *elliptica*, G); *H. O. Forbes 3116.*

PHILIPPINE ISLANDS. MINDORO: *M. L. Merritt, For. Bur. 6768; M. Ramos, Bur. Sci. 39637.*—PALAWAN: *G. Edano, Bur. Sci. 77451.*

CAROLINE and MARIANNE ISLANDS: *R. Kanehira 640, 702, 804, 1195, 1514, 1954, 2071, 2190.*

INDO-CHINA: *J. & M. S. Clemens 4218; A. Petelot 1545; J. Harmand 831.*

INDIA: *J. D. Hooker & T. Thomson s.n.; E. Johnson s.n.; Hocks s.n.; E. H. Wilson s.n.; L. L. Uhl s.n.; D. Prain 16; H. Tireman 21; W. Bembower 42, 77; W. Griffith 734, 735; D. Brandis 823; N. Wallich 4399* (isotype of *E. fasciculata*, NY); *F. K. Ward 9060; U. Kanjilal 4655; A. Saulière 55.*

CHINA. KWANGTUNG: *L. Tang 8359; Y. F. Kiang 9255; N. K. Chun 42826, 43039; W. Y. Chun 5130, 5290, 5853, 5898, 6093, 6837, 6838, 6844; H. Handel-Mazzetti 377; H. T. Ho 60176; S. P. Ko 50390, 52925, 53550, 54622, 54749; Y. Tsiang 173, 2340, 2638; S. P. Kwok 80065; S. K. Lau 2433, 2715, 25170; H. Y. Liang 61244, 61359; C. Wang & H. Y. Liang 31663, 31716; W. T. Tsang 16604, 20905; C. L. Tso 20772, 21622, 21759; C. Wang 30278, 30318, 32446, 37800, 38143; C. Wright s.n.; C. S. Sargent s.n.; C. Ford s.n.*—HAINAN: *N. K. Chun & C. L. Tso 43422, 43606, 43716; H. Fung 20129; F. C. How 71672, 73276; S. P. Ko 52186; S. K. Lau 1532, 2903, 3591; C. I. Lei 293, 398, 816; H. Y. Liang 61512, 62104, 64085, 64094, 64242, 64309, 64699, 64961, 65218, 65394, 65112, 66466, 66468; W. T. Tsang 60, 275, 276, 637, 23667; C. Wang 32885, 33206, 33503, 35715, 36289.*—CHEKIANG: *A. N. Steward 2435; T. N. Liou 7449; T. Tang 148; R. C. Ching 1333, 1649, 2024, 4836, 4916, 5176; M. Chen 627, 890; C. Y. Chiao 14214, 14368, 14433, 14516, 14523, 14575, 14676, 18840; H. H. Hu 251, 775, 1661; Y. L. Keng 137, 148, 171, 282, 566, 655, 744, 1055, 1098.*—ANHWEI: *N. K. Ip 4771; R. C. Ching 2694, 2908, 3016; M. Chen 1078; S. C. Sun 1207.*—KIANGSI: *H. H. Hu 2391; Y. Tsiang 10600,* in part; *W. Y. Chun 4304; E. H. Wilson 1572, 1579; A. N. Steward & H. C. Cheo 504.*—KIANGSU: *R. C. Ching & C. L. Tso 404, 431; W. Y. Chun 2604.*—HUNAN: *H. Handel-Mazzetti 467, 483, 11413.*—HUPEH: *H. C. Chow 754, 1751; E. H. Wilson* (Veitch) *1751, 3544; A. Henry 1907, 2344, 3687, 7946; W. Y. Chun 3710; H. C. Cheo & C. Y. Chiao 18178.*—KWANGSI: *A. N. Steward & H. C. Cheo 822, 863; R. C. Ching 5931; W. T. Tsang 22004; H. Y. Liang 67442; S. K. Lee 81067.*—KWEICHOW: *H. Handel-Mazzetti 145; S. W. Teng 684; Y. Tsiang 4181, 7721, 7521, 8598.*—FUKIEN: *H. H. Chung 2205, 2665, 3725, 4026, 6415; J. B. Norton 1576.*—YUNNAN: *E. E. Maire 113, 214, 2465; J. F. Rock 7548, 7867; G. Forrest 7573, 7598, 8021, 14829; Y. Tsiang 13077; H. Handel-Mazzetti 5708; H. T. Tsai 55756, 57130.*—SZECHUAN: *A. Henry 7099; C. Y. Hwang 171; W. P. Fang 504, 672, 2035, 2074, 2308, 2334, 2337, 5727; S. F. Chang 952; Y. Chen 5730; F. T. Wang 20576, 22492.*

This species, which was first described by Korthals from material grown in Sumatra, has a larger geographical range than most species in the genus. Found originally in the Dutch East Indies it extends north to the Philippine Islands and west into China where it is found in the majority of the southern and eastern provinces.

There is a variation to be found, naturally, in a species with such an extensive range. The Chinese material has heavier thicker leaves than the material found in the Dutch East Indies.

However, the variation is not sufficient to warrant specific or varietal delimitation.

Though often confused with *E. japonica* because both species are strictly glabrous, they can be separated easily by their geographical distributions. The range of *E. japonica* is limited to Japan only, while *E. nitida,* a widespread species, is never found there. Also *E. japonica* has an undulating, soft serration while the serration in *E. nitida* is sharp and close.

Eurya virens Blume, *E. myrtifolia* Blume, *E. Hasseltii* Blume and *E. anceps* Blume were reduced to synonomy under *E. nitida* by Miquel. The only one of the four that could be questioned is *E. anceps.* The leaves in this Javan representative are perhaps a little wider than typical *E. nitida,* hence taper a trifle more abruptly at the apex. However, I agree with Miquel and feel that this variation is hardly worthy of consideration.

Of *E. Zollingeri,* only a good-sized fragment of the type was available. This was found in the Field Museum of Natural History. It resembles *E. nitida* in all visible characters. However, no flowers or fruit were to be had. Choisy, in referring to the style, says "Stylus unicus apice 3-partitus." One naturally assumes that the style is elongated. In such a case the species would naturally fall into the synonomy of *E. nitida.*

Eurya ladronica, E. palauensis and *E. ponapensis,* all described by Hosakawa in 1935 from the Marianne and Caroline Islands, belong under this species. Kanehira in his enumeration of the Micronesian flora intimates in a footnote that after comparing a large number of specimens collected in the same regions as Hosakawa's species, he could find no striking differential characters. He merely mentions the proposed new species pending a more intensive study. I also have material (Kanehira's) from these localities, and although none are mentioned by Hosakawa in his study they are undoubtedly the same species.

True *E. nitida* is found in the Philippines on the islands of Palawan and Mindoro. Also a single specimen from the province Caramines Sur on the island of Luzon. However, the

majority of material from Luzon varies from the true *E. nitida* in having rather short styles free to the base. The majority of specimens are those with mature fruit in which the styles may have been broken off partly or entirely. These specimens may be worthy of specific delimitation but the consistent variation seems to be found in the style only and, as has been mentioned before, considerable variation in the style may be found on a single plant.

7a. **Eurya nitida** Korthals var. **aurescens** (Rehder & Wilson), comb. nov.

Eurya japonica Thunberg var. *aurescens* Rehder & Wilson in Sargent, Pl. Wilson. 2: 399(1915).

Eurya aurescens (Rehder & Wilson) Handel-Mazzetti, Symb. Sin. 7²: 400 (1931), quoad syn., excl. descript.

DISTRIBUTION: China (Hupeh, Kiangsu, Chekiang, Fukien, Kweichow, Szechuan, Kwangsi), Indo-China.

CHINA. HUPEH: woods, Changyang Hsien, alt. 600–1300 m., *E. H. Wilson 3545* (type, AA), April and September 1907 (shrub 2–6 m. tall; flowers white or pink; fruit black); *E. H. Wilson 22; H. C. Chow 1253, 1943, 1961; W. Y. Chun 3992, 4148; A. Henry 3673, 5147, 5162, 5170, 6693, 7830; H. C. Cheo 184.*—KIANGSU: *Y. Tsiang 9939, 10046, 10600* (in part); *H. H. Chung & S. C. Sun 502; C. Y. Cheo 18801; T. N. Hsiung 472.*—CHEKIANG: *C. Y. Chiao 14613.*—FUKIEN: *native collector for H. H. Chung 4001.*—KWEICHOW: *Y. Tsiang 6769, 7003.*—SZECHUAN: *W. P. Fang 2307, 2413, 3809, 5703, 5808, 7603, 7755; C. Bock & A. von Rosthorn 2165; A. Henry 5616.*—KWANGSI: *W. T. Tsang 21865.*

INDO-CHINA: *J. & M. S. Clemens 3451, 3927.*

This variety, very closely related to *E. nitida*, can be separated by its larger, generally thicker, coriaceous leaves, rounded at the base and abruptly short-acuminate at the apex. Usually the under-surface of the leaf is bright yellow. This last character does not always hold and may be found at times characteristic of individual specimens of *E. nitida* itself.

When originally described by Rehder and Wilson as *E. japonica* var. *aurescens*, their concept of *E. nitida* was that of a second variety of *E. japonica*. These authors noted the relationship between the two varieties and at that time seemed to be among the few botanists who actually felt that *E. japonica* was not native to China.

Handel-Mazzetti raised this variety to specific rank under the name *E. aurescens*. Unfortunately, Handel-Mazzetti was not working with representative material of this variety but with that of a new species *(E. Handeliana)* described in the present study.

8. **Eurya obliquifolia** Hemsley in Hooker's Icon. **28**: t. 2761 (1903).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: China (Yunnan).

CHINA. YUNNAN: mountain forests, southwest of Mengtze, alt. 1525 m., *A. Henry 10914, 10914A, 10914B* (in part), (isotypes, AA, NY) (tree 10 m.); *Y. Tsiang 13078.*

This species is closely allied to *E. glandulosa*. It can be separated, however, by its larger leaves (up to 10 cm.) which are membranaceous rather than coriaceous and attenuate-acuminate at the apex. The leaves of *E. glandulosa* are decidedly revolute and from the upper surface appear entire. The leaf margins of *E. obliquifolia* are not revolute and are decidedly serrate.

9. **Eurya glandulosa** Merrill in Philipp. Jour. Sci. Bot. **12**: 107(1917).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Eurya Weissiae Chun in Jour. Arnold Arb. **9**: 128(1928).—**Syn. nov.**

DISTRIBUTION: China (Kwangtung, Kwangsi, Kweichow, Yunnan).

CHINA. KWANGTUNG: in damp, shaded ravines, alt. 1000 m., *E. D. Merrill 10379* (type, NY, photo. AA), Oct. 28, 1916; North River region, *W. Y. Chun 5791, 5791a* (types of *E. Weissiae)*, Dec. 1927 (AA, SY).—KWANGSI: *R. C. Ching 5942.*—KWEICHOW: *Y. Tsiang 6258, 6259.*—YUNNAN: *H. T. Tsai 51739; Y. Tsiang 13344.*

Unfortunately the specimen from which Merrill drew up his original description for this species was older and generally less pronounced in character than the material used by Chun in his description of *E. Weissiae*. The variations between the two are those of degree rather than true morphological differences. On careful study of a series of specimens these differences vanish.

This species is characterized by terete stems, auriculate, coriaceous leaves (4–6 cm long, 1.5–3 cm. wide) with pronounced reticulate veining on the lower surface. These veins are impressed above. The young stems, terminal leaf-buds and calyx lobes are hirsute. The style is approximately 1 mm. long and connate for most its length.

It is closely related to *E. disticha* from which it can easily be separated by its coriaceous leaves, pronounced reticulate veining, leaf width and short style. A second related species is *E. obliquifolia* (Yunnan) which differs from *E. glandulosa* in its larger (up to 10 cm.) leaves, which are membranaceous rather than coriaceous, attenuate-acuminate at the apex, with serrated margins which are not revolute.

10. **Eurya emarginata** (Thunberg) Makino in Bot. Mag. Tokyo, **18**: 19(1904), excl. syn. *Eurya chinensis*.—Rehder & Wilson in Sargent, Pl. Wilson. **2**: 400(1915).—Mori, Enum. Corean Pl. 251(1922).—Makino & Nemoto, Fl. Jap. 552(1925).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148 (1925).—Nakai, Fl. Sylv. Kor. **17**: 81(1928).

Ilex emarginata Thunberg, Fl. Jap. 78(1784); in Murray, Syst. Veg. ed. 14, 168(1784).—Vitman, Summa Pl. **1**: 342(1789).—Willdenow, Sp. Pl. **1**: 170 (1798).—Persoon, Syn. Pl. **1**: 151(1805).—Poiret, Suppl. Encycl. **3**: 66 (1813).—Roemer & Shultes, Syst. Veg. **3**: 491(1818).—A. P. de Candolle, Prodr. **2**: 16(1825).—G. Don, Gen. Hist. **2**: 19(1832).—Miquel, Cat. Mus. Bot. Lugd.-Bat. 19(1870).

Eurya littoralis Siebold apud Siebold & Zuccarini in Abh. Akad. Münch. **4**: 163 (Fl. Jap. Fam. Nat. **1**: 55)(1845), *nomen nudum*.

Eurya chinensis sensu Blume, Mus. Bot. Lugd.-Bat. **2**: 108(1856).—Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 15(1866), in part.—Franchet & Savatier, Enum. Pl. Jap. **1**: 58(1875).—Hemsley in Jour. Linn. Soc. London, **23**: 76(1886), in part.—Nakai in Jour. Coll. Sci. Tokyo, **26**: 100(1909).—Non R. Brown.

DISTRIBUTION: Japan, Liu Kiu Islands, Korea, China (Chekiang, Fukien).

JAPAN: prope Nagasaki (type, Thunberg Herb., Upsala; photo. AA); *E. Oldham s.n.; C. J. Maximowicz s.n.; K. Sakurai s.n.*

LIU KIU ISLANDS: *U. Faurie 3821; E. H. Wilson 6057, 8043; R. Kanehira 3174, 3255, 3303, 3379; G. Masamune s.n.*

KOREA: *E. Taquet 2690, 2691; U. Faurie 493; E. H. Wilson 9555.*

CHINA. CHEKIANG: *K. K. Tsoong 116; R. C. Ching 1929.*—FUKIEN: *W. Y. Chun 8103; H. H. Chung 6201, 6356.*

This species was described originally by Thunberg (1784) as *Ilex emarginata* and was not transferred to *Eurya* until 1904 when Makino made the transfer. It is characterized as a shrub or small tree with thick, coriaceous, cuneate, obovate to oblong-obovate, emarginate leaves with revolute, crenate-serrate margins. The young branchlets are clothed with a short, rufous-brown villous tomentum.

Considered confined to Korea, Japan and Liu Kiu, only recently material collected in Fukien and Chekiang shows this species as inhabiting China as well.

10a. **Eurya emarginata** Makino var. **microphylla** Makino in Bot. Mag. Tokyo, **24**: 29(1910).

DISTRIBUTION: Japan (cultivated).

JAPAN: Cultivated, Kyoto, Yamasiro Prov., Hondo, *K. Shioto B978*, Aug. 31, 1915.

This fine cultivated variety of *E. emarginata* is characterized by very small obovate-orbicular, emarginate leaves. Makino states that the leaves are 3.0–9.0 mm. long, 2.5–7.0 mm. wide. In the specimen examined for this study none were found to be over 7.0 mm. long. Also there were no evidences of flowers or fruit on the specimen studied. Makino makes no mention of these same parts in his original description. The branchlets are many and softly puberulent; the small leaves are regularly distichous.

Because of its small leaves it might at first be mistaken for *E. japonica* var. *microphylla*. However, the latter variety has larger, oblong-obtuse leaves, rounded apex, not emarginate and is glabrous throughout.

11. **Eurya cuneata**, spec. nov.

Frutex vel arbor parva, ramis ramulisque teretibus firmis, ramulis novissimis et gemmis ultimis pubescentibus; foliis oblongo-obovatis ad elliptico-obovatis 6–9 cm. longis et 2.0–3.5 cm. latis utrinque glabris basi subtus excepta supra fusco-viridibus subtus pallide viridibus obtuse acuminatis subtus distincte cuneatis integerrimis vel fere integerrimis, petiolis 5

mm. longis; floribus axillaribus singularibus vel binis; florum ♂ pedicellis 4 mm. longis, sepalis 5 crassis imbricatis obtusis 3 mm. longis, petalis 5 ad basin conjunctis rotundatis obtusis 4.0–4.5 mm. longis, staminibus 15, filamentis gracilibus 1.5 mm. longis, antheris apiculatis 1.0 mm. longis, ovariis rudimentariis; florum ♀ pedicellis 1 mm. longis, sepalis 5 glabris crassis obtusis 1.5 mm. longis, corolla non visa, ovario glabro ovato 1.5 mm. longo et 1 mm. lato, stylis connatis apice trifidis 1.10 mm. longis; fructu non viso.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: in thickets, Tingon, Dung Ka, alt. 600 m., *N. K. Chun & C. L. Tso 44274* (holotype, AA), Nov. 17, 1932 (small tree 4 m. high; flowers white; bark brownish gray) (AA, NY); *H. Y. Liang 64174; F. C. How 73578, 73709; C. Wang 34659, 36048.*

This species is characterized by entire or nearly entire, oblong-obovate or elliptic-obovate leaves, and firm, terete branches and branchlets which are pubescent when young. This pubescence is found also on the terminal buds. In margin it resembles somewhat *E. Macartneyi.* However, it can be quickly distinguished from *E. Macartneyi* by its pubescent buds and branchlets. From the material examined this species is confined to the island of Hainan.

11a. **Eurya cuneata** Kobuski var. **glabra,** var. nov.

A typo recedit ultimis gemmis glabris.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: in forest, Mo San Leng, alt. 900 m., *N. K. Chun & C. L. Tso 44325* (type, AA), Nov. 22, 1932 (tree 8 m.; bark gray; leaves deep green, glabrous; flowers white, fragrant); *N. K. Chun & C. L. Tso 44290; C. Wang 35942; H. Y. Liang 64380, 64381.*

Like the species, this variety is found only on the island of Hainan. It resembles the species in all respects save that it is strictly glabrous even to the young stems and terminal buds. As in the species the stamen number is 15 and the petals are united at the base.

12. **Eurya Fangii** Rehder in Jour. Arnold Arb. **11**: 165 (1930).

DISTRIBUTION: China (Szechuan).

CHINA. SZECHUAN: in thickets, Omei hsien, Mt. Omei, alt. 2600–2750 m., *W. P. Fang 2917* (isotype, NY), Aug. 13, 1928 (shrub 1 m. tall); *E. Faber 662.*

This species is characterized by deeply impressed veins on the upper surface. Sharp points terminate the serrations on the leaves. Also distinctive are its hirsute branchlets and ciliolate sepals. The species is quite closely allied to *E. Handeliana* from which it differs especially in its smaller leaves and hirsute branchlets. Although occurring in both species the degree of vein impression is more pronounced in *E. Handeliana.*

13. **Eurya chinensis** R. Brown in Abel, Narr. Jour. China, 379, t.(1818).—DeCandolle, Prodr. **1**: 525(1824).—Champion in Hooker's, Jour. Bot. & Kew Gard. Misc. **3**: 307(1851); in Trans. Linn. Soc. London, **21**: 113(1855).—Seemann, Bot. Voy. Herald, 366(1857).—Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893).—Dunn & Tutcher in Kew Bull. Misc. Inform. Add. Ser. **10**: 44 (Fl. Kwangtung & Hongkong)(1912).—Rehder & Wilson in Sargent, Pl. Wilson. **2**: 400(1915).

Eurya parvifolia Gardner in Calcutta Jour. Nat. Hist. **7**: 445(1847).
Eurya japonica Thunberg var. δ. *parvifolia* Thwaites, Enum. Pl. Zeyl. 41(1864).

DISTRIBUTION: China (Kwangtung, Fukien, Kwangsi, Yunnan), Formosa, Ceylon.

CHINA. KWANGTUNG: in fields, *C. Abel s.n.* (type in BM; photo. and fragment, AA); *K. Bushwell 6336; S. R. Chiang 155; N. K. Chun 40064, 40477, 42237, 42238, 42866, 43004, 44419; W. Y. Chun 5043, 5501, 5503, 5519, 5596, 5713, 6061, 6238, 6422, 7176; J. L. Gressitt 1264; S. Lam 9490; T. M. Tsui 167, 423; C. Wang 1851, 31989, 37609, 37783; W. T. Tutcher 987; Y. K. Wang 1821, 1851; K. K. Wang 337, 592; C. Wilford s.n.; C. Wright 54; S. K. Lau 668, 675, 2385, 24440, 25329; S. Y. Lau 20060; E. D. Merrill 10290; C. O. Levine 191, 206, 1474, 1836, 1922, 3296, 3495; S. P. Ko 53743, 53753; F. A. McClure 7091; H. F. Hance 497; F. C. How 71155; F. H. Hwang 9390, 9425, 9462; T. C. Lai 6, 45; H. Y. Liang 61843, 61866; C. S. Niu 8105; W. T. Tsang 4, 20166, 20338, 20534, 21610; Y. Tsiang 1139, 1146, 1602, 1729, 3298, 3554; C. L. Tso 20457, 21396, 21543.*—FUKIEN: *F. P. Metcalf 5917.*—YUNNAN: *G. Forrest 7663, 9367, 9689, 11728, 12209, 25334; H. T. Tsai 55608, 55965, 55971, 56484.*—KWANGSI: *S. T. Hwang 1025, 1122; R. C. Ching 7776, 8048, 8698; W. T. Tsang 22008, 23353; H. Y. Liang 67134, 67186; W. H. Soo 68212.*

FORMOSA: *S. Suzuki 3507; J. L. Gressitt 81; T. Tanaka 13474; U. Faurie 285, 292; G. Masamune & K. Mori s.n.; A. Henry 375, 1465.*

CEYLON: *Walker (C.P.) 784.*

The young branchlets and terminal buds are pubescent. The leaves are obovate, bluntly acuminate at apex, distinctly cuneate at base. The specimens are usually small-leafed, sometimes larger, however, always in proportion.

Eurya emarginata is similar to this species but can be separated by its heavier, coriaceous leaves which are always rounded-emarginate at the apex rather than bluntly acuminate. The leaf-margin in leaves of *E. emarginata* are also usually revolute.

The geographical distribution of *E. chinensis* seems very incomplete. However, when other states of China have been worked over and studied to the extent that the flora of Kwangtung has, the gaps in distribution, evident at present, will be filled in. This species must grow profusely because along with the original description the author, in discussing the landscape, remarked that it was covered with this species of *Eurya.*

14. **Eurya ceylanica** Wight, Ill. Indian Bot. **1**: 98(1838).—Gardner in Calcutta Jour. Nat. Hist. **7**: 444(1847).—Thiselton-Dyer in Hooker, f., Fl. Brit. Ind. **1**: 285(1874).

Eurya japonica Thunberg var. *γ. chinensis* Thwaites, Enum. Pl. Zeyl. 41(1864).

DISTRIBUTION: Ceylon.

CEYLON: *T. Thomson s.n.; E. Gardner 91; T. Petch s.n.*

Only four specimens were available for study. Two of these four (Thomson, Gardner) are quite authentic specimens and figured in the early literature of this species.

The species is characterized by heavy coriaceous leaves (4–6 cm. long, 1.5–2.5 cm. wide) with veins impressed on the upper surface and pronouncedly upraised on the lower surface. The margins are generally revolute and serrate for the upper three-quarters. Also the leaves are cuneate at the base and obtusely acuminate at the apex. The terminal bud is hairy, as are the younger branchlets and midrib of the leaves. The styles are short and recurved.

Because of its heavily veined reticulate under-surface of the leaves, this species at first resembles *E. glandulosa* Merrill. However, the distinctly cuneate base of the leaf, in contrast to

the lobed, subsessile base of *E. glandulosa*, immediately identifies it.

15. **Eurya acuminata** DeCandolle in Mém. Soc. Phys. Genève, 1: 418 (Mém. Fam. Ternstroem. 26)(1822); Prodr. 1: 525 (1824).—Wallich, Num. List, No. 1464(1828).—Royle, Ill. Bot. Himal. 1: 127(1834); 2: t. 24(1839).—Walpers, Repert. Bot. Syst. 1: 370(1842).—Blume, Mus. Bot. Lugd.-Bat. 2: 117 (1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).—Thiselton-Dyer in Hooker f., Fl. Brit. Ind. 1: 285(1874).—Kurz in Jour. As. Soc. Bengal, 43²: 91 (Burmese Fl.) (1874).—Theobold in Mason, Burma, 2: 631(1883).—Trimen, Handb. Fl. Ceylon, 1: 110(1893).—Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. 6: 190(1893).—Kanjilal, For. Fl. School Circle, N-W.P. 31(1901); For. Fl. Siwalik & Jaunsar For. Div. U.-P. Agra & Oudh, 53(1911).—Strachey, Cat. Pl. Kumaon Adj. Port. Garhwal & Tibet, 22(1906).—Rehder & Wilson in Sargent, Pl. Wilson. 2: 400(1915).—Ridley, Fl. Malay Pen. 1: 199 (1922).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 21: 147(1925).—Osmaston, For. Fl. Kumaon, 42(1927).—Yamamoto in Sylvia, 5: 38, fig. 23(1934).

Eurya multiflora DeCandolle in Mém. Soc. Phys. Genève, 1: 417 (Mém. Fam. Ternstroem. 25)(1822); Prodr. 1: 525(1824).

Geeria serrata Blume, Bijdr. Fl. Nederl. Ind. 3: 124(1825).

Geeria serrata Blume var. *sericea* Blume, Bijdr. Fl. Nederl. Ind. 3: 124(1825).

Geeria angustifolia Blume, Bijdr. Fl. Nederl. Ind. 3: 125(1825).

Ternstroemia bifaria Hamilton ex D. Don, Prodr. Fl. Nepal. 145(1825), pro. synon.

Diospyros serrata Hamilton ex D. Don, Prodr. Fl. Nepal. 145(1825).

Eurya angustifolia Wallich, Num. List, no. 1465(1828), *nomen nudum*.—Walpers, Repert. Bot. Syst. 1: 370(1842).

Eurya lucida Wallich, Num. List, no. 1462(1828), *nomen nudum*.—Blume, Mus. Bot. Lugd.-Bat. 2: 118(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).

Eurya bifaria Wallich, Num. List, no. 3721(1829), *nomen. nudum*.

Eurya euprista Korthals in Temminck, Verh. Nat. Gesch. Bot. 3: 113(1840).—Walpers, Repert. Bot. Syst. 1: 369(1842).—Blume, Mus. Bot. Lugd.-Bat. 2: 116(1856).—DeVries, Pl. Ind. Bat. Orient. Reinw. 28(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).—Miquel, Fl. Nederl. Ind. 1²: 474 (1859).

Eurya Blumeana Korthals in Temminck, Verh. Nat. Gesch. Bot. 3: 119(1840).—Walpers, Repert. Bot. Syst. 1: 369(1842).—Blume, Mus. Bot. Lugd.-Bat.

2: 120(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).—Miquel, Fl. Nederl. Ind. 1²: 475(1859).—Koorders & Valeton, Bijdr. Boomsoorten Java, 3: 245(1896).

Eurya serrata (Blume) Walpers, Repert. Bot. Syst. 1: 369(1842).—Blume, Mus. Bot. Lugd.-Bat. 2: 115(1856).—DeVries, Pl. Ind. Bat. Orient. Reinw. 29(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).—Miquel, Fl. Nederl. Ind. 1²: 474(1859).—Mason, Burma People Prodr. 2: 631(1883).

Eurya angustifolia (Blume) Walpers, Repert. Bot. Syst. 1: 369(1842).—Blume, Mus. Bot. Lugd.-Bat. 2: 119(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).—Miquel, Fl. Nederl. Ind. 1²: 475(1859).

Eurya membranacea Gardner in Calcutta Jour. Nat. Hist. 7: 444(1847).

Eurya phyllanthoides Blume, Mus. Bot. Lugd.-Bat. 2: 110(1856).—DeVries, Pl. Ind. Bat. Orient. Reinw. 27(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 343(1857).—Miquel, Fl. Nederl. Ind. 1²: 470(1859), "*E. phyllantoides*"; Ann. Mus. Bot. Lugd.-Bat. 4: 105(1868-69).—Vesque in Bull. Soc. Bot. France, 42: 153(1895).

Eurya phyllanthoides Blume var. *brevifolia* Blume, Mus. Bot. Lugd.-Bat. 2: 111(1856).—DeVries, Pl. Ind. Bat. Orient. Reinw. 28(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 343(1857).

Eurya serrata Walpers var. *firma* Blume, Mus. Bot. Lugd.-Bat. 2: 116(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).

Eurya serrata Walpers var. *membranacea* Blume, Mus. Bot. Lugd.-Bat. 2: 116(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).

Eurya euprista Korthals β. var. *heteroidea* Blume, Mus. Bot. Lugd.-Bat. 2: 117(1856).

Eurya acuminata DeCandolle var. *multiflora* Blume, Mus. Bot. Lugd.-Bat. 2: 117(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 345(1857).

Eurya Wallichiana Blume, Mus. Bot. Lugd.-Bat. 2: 118(1856), non Steudel.

Eurya salicifolia Blume, Mus. Bot. Lugd.-Bat. 2: 118(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).

Eurya confinis Blume, Mus. Bot. Lugd.-Bat. 2: 119(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).

Eurya confinis Blume var. *fusca* Blume, Mus. Bot. Lugd.-Bat. 2: 119(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).

Eurya rostrata Blume, Mus. Bot. Lugd.-Bat. 2: 119(1856).—Miquel, Fl. Nederl. Ind. 1²: 475(1859).

Eurya clandestina Blume, Mus. Bot. Lugd.-Bat. 2: 121(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 346(1857).—Miquel, Fl. Nederl. Ind. 1²: 476(1859).—Vesque in Bull. Soc. Bot. France, 42: 154(1895).

Eurya clandestina Blume var. *minor* Blume, Mus. Bot. Lugd.-Bat. 2: 121(1856).—Mueller in Walpers, Ann. Bot. Syst. 4: 347(1857).

Eurya hirsutula Miquel, Sumatra, 477(1862).

Eurya japonica Thunberg var. β. *acuminata* Thwaites, Enum. Pl. Zeyl. 41(1864).

Eurya japonica Thunberg var. *phyllanthoides* (Blume) Thiselton-Dyer in Hooker f., Fl. Brit. Ind. 1: 284(1874).—Koorders & Valeton, Bijdr. Boomsoorten Java, 3: 237(1896).

Eurya acuminata DeCandolle var. *euprista* (Korthals) Thiselton-Dyer in

Hooker f., Fl. Brit. Ind. **1**: 285(1874).—Pitard in Lecomte, Fl. Gén. Indo-Chine, 1: 339(1910).—Baker f., in Jour. Bot. **62**: suppl. 9(1924).

Eurya Wrayi King in Jour. As. Soc. Beng. **52**[2]: 196(1890).—**Syn. nov.**

Eurya acuminata DeCandolle var. *monticola* Ridley in Jour. Str. Br. Roy. As. Soc. **16**: 1(1912).—**Syn. nov.**

Eurya arisanensis Hayata, Icon. Pl. Formos. **8**: 6, fig. 4(1919).—Yamamoto in Jour. Soc. Trop. Agric. **5**: 348(1933).—Makino & Nemoto, Fl. Japan, ed. 2. 741(1931).—Yamamoto in Sylvia, **5**: 39, fig. 24(1934).—**Syn. nov.**

Eurya Matsudai Hayata, Icon. Pl. Formos. **9**: 6, fig. 5(1920).—Sasaki, List. Pl. Formos. 293(1928).—Makino & Nemoto, Fl. Japan, ed. 2. 742(1931).—Yamamoto in Jour. Soc. Trop. Agric. **5**: 349(1933); in Sylvia, **5**: 41, fig. 31(1934).—**Syn. nov.**

Eurya nitida Korthals var. *strigillosa* Handel-Mazzetti, Symb. Sin. **7**[1]: 400 (1931).—**Syn. nov.**

Eurya glaberrima Hayata var. *acuminata* Suzuki in Ann. Rept. Taihoku Bot. Gard. **1**: 158(1931).—**Syn. nov.**

Eurya Suzukii Yamamoto in Jour. Soc. Trop. Agric. **5**: 349(1933); in Sylvia, **5**: 42, fig. 34(1934).—**Syn. nov.**

DISTRIBUTION: India, Malay Peninsula, Ceylon, Java, Sumatra, Formosa, China (Szechuan, Yunnan).

INDIA: Nepal, *N. Wallich 1464*, in part (type; photo. and fragment, AA); *N. Wallich 1464*, in part (type of *E. multiflora;* photo. and fragment, AA); *N. Wallich 1462* (type of *E. lucida;* photo. and fragment, AA); *N. Wallich 1463* (type of *E. Roxburghii;* photo. and fragment, AA); *N. Wallich 3721* (type of *E. bifaria;* photo. and fragment, AA); *E. Gardner s.n.* (type of *E. nephalensis;* photo. and fragment, AA); *J. D. Hooker s.n.; J. D. Hooker & T. Thompson s.n.; B. Ram 152, 2335; A. E. Osmaston 216, 218; A. T. Gage 93; H. Singh 238; W. Griffith 738; N. E. Parry 845; R. N. Parker 2042, 2118; R. R. Stewart 11411, 13224.*

MALAY PENINSULA: Penang, *N. Wallich 1465* (type of *E. angustifolia;* photo. and fragment, AA); Perak, *L. Wray 1273* (type of *E. Wrayi;* photo. AA); Perak, *H. N. Ridley s.n.* (type of *E. acuminata* var. *monticola;* photo. and fragment, AA); *Haniff 227; A. C. Maingay 187, 1069; J. F. Rock 1807; M. R. Henderson 22670.*

CEYLON: *E. Gardner 92* (type of *E. membranacea;* photo. and fragment, AA); *G. Thwaites s.n.*

JAVA: Buitenzorg, *C. L. Blume s.n.* (isotype of *E. phyllanthoides*, AA, G, NY); *C. L. Blume s.n.* (isotype of *E. clandestina*, G, NY); *collectors unidentified* (isotype of *E. serrata*, NY; *E. serrata* var. *membranacea*, G; *E. serrata* var. *firma* G, NY; *E. serrata* var. *confinis*, photo. and fragment, AA; *E. clandestina* var. *minor*, G; *E. rostrata*, NY; *E. euprista*, NY); *W. H. de Vriese s.n.; J. E. Teysmann s.n.; Lobb s.n.; O. Warburg 3367, 3368.*

SUMATRA: Supajang Distr., *J. E. Teysmann s.n.* (isotype of *E. hirsutula*, G); *collector unidentified* (isotype of *E. euprista* var. *heteroidea*, G); *C. Hamel & R. S. Toroes 1161; B. A. Krukoff 325, 328, 4404; R. S. Toroes 155, 1570, 1733, 1874, 2193, 2389, 2742, 3017, 3996, 4352, 4414; H. S. Yates 804, 875, 1006, 1045, 1916, 1933, 2403; W. N. & C. M. Bangham 1094; H. O. Forbes 1941, 2482; H. H. Bartlett 7119, 7607, 7742, 8038, 8326.*

FORMOSA: *E. Kanehira 2847, 21163; U. Faurie 294, 1328, 1329; A. Henry 122; J. L. Gressitt 268, 274, 293; O. Warburg 9976; E. H. Wilson 9676, 9726, 10858.*

CHINA. SZECHUAN: *T. T. Yü 1533, 1775; F. T. Wang 22782.*—YUNNAN: *Y. Tsiang 11958, 12339; G. Forrest 22586; A. Henry 11171, 11414a; E. H. Wilson 4767; H. T. Tsai 54230, 54238, 54439, 56693, 57394, 57613, 57983, 58341, 58364, 59881, 59920.*

DeCandolle described *E. acuminata* and *E. multiflora* in the same publication with the latter name having page priority over the name accepted in this paper. However, since page priority no longer is considered a nomenclatorial rule the name *E. acuminata,* because of it long use in botanical literature, is accepted without hesitation. To use the name *E. multiflora* would confuse the literature of the species.

The synonyms cited in this paper are many. Most of these names have figured very little in botanical literature. The characters used in delimiting the species are very trivial and some species possess no seeming differences at all. Professor Rehder, of the Arboretum Staff, while on his recent visits to European herbaria searched diligently for types of this genus and returned with photographs and fragments of most of these species. They are deposited now in the herbarium of the Arnold Arboretum. These photographs and fragments have helped tremendously in working over this species.

Eurya Wrayi, E. arisanensis, E. Matsudai, E. glaberrima var. *acuminata, E. nitida* var. *strigillosa* and *E. Suzukii* are the modern species found in this study to be synonymous with *E. acuminata.* No discussion of these transfers is really necessary. The Formosan botanists before me have realized that their species were probably the same as *E. acuminata.* This they have shown by their recent determinations of Formosan material.

Eurya nitida var. *strigillosa* Handel-Mazzetti undoubtedly belongs to *E. acuminata,* resembling the species in all respects. The apex of the leaf may be a little less acuminate than usual, but in *Schneider 2702,* a paratype of var. *strigillosa,* the apex is typical. *Eurya nitida* is characterized by its strict absence of pubescence even to the terminal bud. Also the young stem is pronouncedly winged. In *E. nitida* var. *strigillosa,* as in *E. acuminata,* the branchlets are quite terete.

A photograph of the type of *E. Wrayi* King shows that

although the leaf base is perhaps a little less tapering than the majority of specimens of *E. acuminata*, this character, along with pointed leaf buds, not only fails to present enough basis for describing a new species but is not sufficiently varying for a variety.

15a. **Eurya acuminata** DeCandolle var. **Groffii** Merrill, comb. nov.

Eurya acuminata DeCandolle var. *multiflora* sensu Rehder & Wilson in Sargent, Pl. Wilson. **2**: 401(1915), non Blume.

Eurya Groffii Merrill in Philipp. Jour. Sci. **25**: 247(1919).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: China (Kwangtung, Kweichow, Kwangsi, Szechuan, Yunnan).

CHINA. KWANGTUNG: on mountain sides, Tiu Kaan Shan, Tsen Uen, *G. W. Groff 2378* (holotype of *E. Groffii* Merr., NY); *H. T. Ho 60112; S. Lam 9511; H. Y. Liang 61827, 61829, 61844; C. Wang 30172, 30196, 37236, 38720; K. K. Wang 386, 1825; S. P. Ko 50111, 53624, 53739, 54606; H. Handel-Mazzetti 66; C. O. Levine 3159; W. T. Tsang 22945; N. K. Chun 41287; Y. Tsiang 540; F. C. How 72031; W. Y. Chun 5989; S. K. Lau 811; C. L. Tso 21393, 23746; T. M. Tsui 609.*—KWEICHOW: *Y. Tsiang 4363, 4647, 7219, 9208, 9233; A. N. Steward, C. Y. Chiao & H. C. Cheo 321.*—KWANGSI: *Y. C. Wang 5256; S. K. Lee 81252; S. P. Ko 55575, 55934, 55958, 56020; R. C. Ching 7251, 8174; W. H. Soo 68186, 68559, 69028; H. Y. Liang 65842, 65889, 66930, 67116.*—SZECHUAN: *E. H. Wilson (Veitch) 4768; W. P. Fang 2338.*—YUNNAN: *H. Handel-Mazzetti 2702* (iso-paratype of *E. nitida* var. *strigillosa* Hand.-Mazz., AA); *Y. Tsiang 12196, 12299, 12683, 13332; G. Forrest 7671, 9315, 16059; J. F. Rock 1997, 2461, 6996, 7072; A. Henry 9021, 10914B; H. T. Tsai 51526, 51768, 52460, 52596, 53134, 54213, 54615, 54828, 54945, 55385, 55673, 55840, 56491, 56661, 56772, 56949, 58863, 58946, 58973, 59114, 59153, 60417, 60679, 61049.*

The geographical range of *E. acuminata* is probably the most extensive of any species in the whole genus. Naturally, as expressed above, this species is also the most variable. In the case of this variety, the author has vacillated in his opinion whether to include it under the species or to recognize it as a separate variety. From the material at hand it appears that *E. acuminata* var. *Groffii* is confined to China while the species itself is found only occasionally in Szechuan and Yunnan.

This variety is the same as Rehder's interpretation of *E. acuminata* var. *multiflora*. The leaves, stems and calyx lobes are considerably more pubescent and the leaves are generally narrower, tapering gradually from base to apex. In the

species, the leaves swell toward the middle, tapering off abruptly.

16. **Eurya cerasifolia** (D. Don), comb. nov.

Diospyros cerasifolia D. Don, Prodr. Fl. Nepal. 144(1825).

Eurya symplocina Blume, Mus. Bot. Lugd.-Bat. **2**: 144(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 345(1857).—Thiselton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 284(1874).—Kurz in Jour. As. Soc. Bengal. **43**[2]: 91 (Burmese Fl.)(1874).—Theobold in Mason, Burma People Prodr. **2**: 631(1883).—Vesque in Bull. Soc. Bot. France, **42**: 154(1895).—Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893).—Duthie, Fl. Upper Gangetic Plain, **1**: 74(1903).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Eurya Wallichiana Planchon ex Thiselton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 285(1874), non Steudel.

DISTRIBUTION: India, Indo-China, China (Yunnan).

INDIA: Nepal, *N. Wallich 1464*, in part (type of *E. symplocina*, photo. and fragment, AA); *E. H. Wilson s.n.; J. D. Hooker s.n.; T. Thomson s.n.; L. F. Rusc 401; W. Griffith 737; J. S. Gamble s.n.; J. F. Rock 7486.*

INDO-CHINA: *A. Petelot 1518A.*

CHINA. YUNNAN: *J. F. Rock 7668; G. Forrest 881; H. T. Tsai 55002, 56888.*

The type specimen of *Diospyros cerasifolia* D. Don has not been seen by the author. This new combination has been made on the strength of Hooker's identification of *D. cerasifolia* with *Eurya symplocina*, since it is evident from the material studied that Hooker understood this species very well. The description of *D. cerasifolia* by Don is rather brief; he states that possibly it may be a new genus.

This close relative of *E. acuminata* is characterized by large leaves (10–13 cm. × 3–4 cm.), oblong-elliptic, entire or serrulate above, obtusely acuminate, usually membranaceous, appressed-pubescent beneath. The branchlets and terminal leaf-buds are pubescent.

17. **Eurya Loquaiana** Dunn in Jour. Linn. Soc. Bot. **38**: 355 (1908).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: China (Fukien, Kwangtung, Hainan, Chekiang, Kwangsi, Kweichow, Szechuan).

CHINA. FUKIEN: in woods on mountain sides near Yenping, alt. 700 m., *LoQuoi, (Hongkong Herb. no.) 2395* (holotype; photo. and fragment AA, NY); *H. H. Chung 2832, 3414.*—KWANGTUNG: *W. Y. Chun 5676, 5737, 7404; N. K. Chun*

41413, 42115, 42870, 42880; C. S. Niu 7999, 8003; S. P. Ko 50832, 50896, 51840, 51887, 53594, 53597; H. Y. Liang 60866, 61047; C. Wang 31036, 31278, 38133; C. Wang & H. Y. Liang 31276, 31321; S. K. Lau 916, 2013; Y. Tsiang 1353.—HAINAN: *C. Wang 35240; F. C. How 73276.*—CHEKIANG: *R. C. Ching 2569; C. Y. Chiao 14700.*—KWANGSI: *R. C. Ching 5721; W. T. Tsang 22778.*—KWEICHOW: *Y. Tsiang 4124, 4430, 4781, 4824, 4999, 5001, 5302, 5490, 6730, 7015, 7605, 7457, 7496, 7726, 7808, 9196, 9330.*—SZECHUAN: *W. P. Fang 2267, 5734; Y. Chen 5716.*

Dunn in his original description states that this species is entirely glabrous except for the flower-bud. As a result most workers have been placing material of the closely allied and strictly glabrous *E. nitida* under the name *E. Loquaiana.* A note on a leaf-tracing made from the type by E. D. Merrill while at Kew throws considerable light on the situation. ". . . styles fruit glabrous. Branchlets very slender, minutely puberulent." Here lies the answer! Instead of flower-buds being pubescent Dunn meant terminal leaf-buds. If the branchlets are puberulent, the leaf-buds in this genus also are puberulent. Material collected at the type locality was found to match perfectly with this new concept of *E. Loquaiana.*

The geographical range of this species is considerably extended to the states listed above.

Following is a description of the male flower made from specimen *C. Wang & H. Y. Liang, no. 31276,* collected in Kwangtung. Sepals 5, slightly pubescent, 1.25 mm. long, subtended by obtuse bracts; petals 5, joined at base, 4.5 mm. long, 2 mm. wide, rounded; stamens 10, filaments 2 mm. long, slender, anthers 1.25 mm. long, apiculate.

Besides the characters mentioned by Dunn, one of importance is the distinct veining on the under surface of the leaves. The veins are usually yellow and raised against the reddish-brown background of the leaf. This attractive meshwork is very noticeable and helpful in identifying the species.

18. **Eurya disticha** Chun in Sunyatsenia, **2**: 52, pl. 15(1934); in Hu & Chun, Icon. Pl. Sin. **5**: 5, pl. 205(1937).

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: on mountain top, Sunyi, *C. Wang 31000* (type, SY), July 20, 1931 (small shrub with deep blue fruit); *C. Wang 31949, 37887, 37894; N. K. Chun 42636; J. L. Gressitt 1259.*

A small shrub with distichous branches. The branchlets are subterete, the youngest parts densely covered with long brownish silky spreading hairs becoming glabrous with age. The leaves are chartaceous, 2-ranked, contiguous or nearly so, oblong, 2.0–3.5 cm. long, 0.7–1.0 cm. wide, auriculate at the base, clasping the stem; the basal lobes are rounded. The apex of the leaf is bluntly acuminate. The style is about 2 mm. long, trifid, joined for most the distance, at least in young flowers. The ovary is glabrous.

The male flowers evidently were not available when Chun drew up his description for the species. The following description is taken from flowers (♂) taken from *C. Wang, no. 37887.* The flowers are axillary usually one to an axil, with a pedicel about 1.5 mm. long. The bracts are minute, oblong, tipped by dark glands. The calyx consisting of 5 sepals is very small for the genus, 1.0 mm. long. The sepals are tipped at the apex by a conspicuous dark gland appearing at first glance as a mucron. This glandular character may have been unnoticed by Chun but it is present in the ♀ flower as well. The 5 petals are approximately 4.5 mm. long, 2.0–2.25 mm. wide, oblong, emarginate at the apex. There are 10 stamens; the filaments are 2.5 mm. long while the anthers are 1.5 mm. long. These latter are apiculate at the apex. Present also is a rudimentary ovary.

19. **Eurya trichocarpa** Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 114(1840).—Blume, Mus. Bot. Lugd.-Bat. **2**: 115(1856).—Miquel, Fl. Nederl. Ind. **1²**: 473(1859); in Ann. Mus. Bot. Lugd.-Bat. **4**: 105(1868–69).—Thiselton-Dyer in Hooker f., Fl. Brit. Ind. **1**: 285(1874).—Szyszylowicz in Engler & Prantl, Nat Pflanzenfam. III. **6**: 190(1893).—Vesque in Bull. Soc. Bot. France, **42**: 161(1895).—Ridley, Fl. Malay. Pen. **1**: 200(1922).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Eurya trichogyna Blume, Mus. Bot. Lugd.-Bat. **2**: 114(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 345(1857).

Eurya acuminatissima Merrill & Chun in Sunyatsenia, **1**: 72(1930).—Handel-Mazzetti in Beih. Bot. Centralbl. **48**: 309(1931).—Chun in Hu & Chun, Icon. Pl. Sin. **5**: 4, pl. 204(1937).—**Syn. nov.**

DISTRIBUTION: Amboina, Borneo, Philippine Islands, India, Indo-China, China (Kwangtung, Kwangsi).

AMBOINA: *Zippel s.n.* (type; photo. and fragment, AA).

BORNEO: *J. & M. S. Clemens 22336, 26166, 26283, 26374, 27705, 29739, 30196, 34020, 34456, 35092; M. S. Clemens 1597, 2022, 9827.*

PHILIPPINE ISLANDS. MINDANAO: *A. D. E. Elmer 10871, 10872, 11467.*—LUZON: *F. Canicosa (For. Bur. No.) 30303; M. Ramos & G. Edano (Bur. Sci. no.) 38727, 38965, 43893.*

INDIA: *W. Griffith 736.*

INDO-CHINA: *A. Petelot 3781, 3882, 4310.*

CHINA. KWANGTUNG: in open, on side of mountain, Yingtak, *C. Wang 516* (type of *E. acuminatissima*), Jan. 14, 1929; *H. Y. Liang 60839, 61165, 61263, 61354, 61355; C. Wang 32150, 38578; C. Wang & H. Y. Liang 31323; Z. S. Chung 11099; W. H. Soo 68141; S. P. Ko 50809, 53507, 53741, 53783; W. T. Tsang 20644, 20885; J. L. Gressitt 1367, 1541; C. L. Tso 20579, 20697, 22693; S. K. Lau 23925, 25221; W. Y. Chun 5899; S. P. Kwok 30128; N. K. Chun 40025, 41844, 41897, 42026, 42874, 42906; R. Mell 765.*—KWANGSI: *W. T. Tsang 22342, 22670, 22739, 23281; R. C. Ching 8377.*

This species is probably one of the most misunderstood in the genus. Usually it is glanced at casually and labeled *E. acuminata*. The outstanding feature is its pubescent ovary. At anthesis the ovary is covered with a mass of silvery-white, silky hairs. During maturity the fruit becomes glabrescent and in some cases it is very difficult to distinguish the species. During anthesis, when the calyx-lobes have just opened, the corolla is usually conical in shape. The leaves are caudate-acuminate, entire for some distance above the cuneate base and throughout the acumen but usually serrulate from the lower one-third to the base of the acumen. The style is trifid and united.

20. **Eurya velutina** Chun in Sunyatsenia, **2**: 57(1934); in Hu & Chun, Icon. Pl. Sin. **5**: 9, pl. 209(1937).

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: in mixed woods, Sunyi Distr., *C. Wang 30903* (isotype, AA); July 14–August 20, 1931 (tree 12 m. tall; leaves green above, paler beneath; fruit green, pubescent); *C. Wang 31786, 37925.*

This species is characterized by its large, ellipsoid, pilose fruit, its long style (4 mm.) which apparently is connate for most its length, its stout branches with 1–4 large fruits maturing together. Chun refers to the branches as angular. To me

they seem more terete or perhaps subterete in contrast to the distinctly angular branches of several other species. The large elliptic-oblong leaves (12–15 cm. long, 4–5 cm. wide) on the stout stem, the size of the tree (36–80 ft.), along with the other robust characters, make this species very outstanding in the genus.

21. **Eurya distichophylla** Hemsley in Jour. Linn. Soc. Bot. **23**: 77(1886).—Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893).—Dunn & Tutcher in Kew Bull. Misc. Inform. Add. Ser. (Fl. Kwangtung & Hongkong), **10**: 43(1912).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Eurya Swinglei Merrill in Philipp. Jour. Sci. Bot. **12**: 106(1917).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).—Handel-Mazzetti in Beih. Bot. Centralbl. **48**: 310(1931).—**Syn. nov.**

DISTRIBUTION: China (Fukien, Kwangtung, Kiangsi, Kwangsi, Kweichow).

CHINA. FUKIEN: Amoy, *R. Swinhoe s.n.* (type; photo. and fragment, AA). —KWANGTUNG: Loh Fau Mt., *Merrill 10233* (holotype of *E. Swinglei*), Oct. 28, 1916; *E. Mell 630; C. O. Levine 1995; W. Y. Chun 6334; E. D. Merrill 10766; W. T. Tsang 20151, 21010, 21168, 21524; C. L. Tso 21635; S. K. Lau 24427, 25004, 25050; C. Wang 30913, 31608, 31617, 31874, 37302, 37865, 37868; N. K. Chun 41096, 41293, 43012, 43040; H. T. Ho 60031.*—KIANGSI: *Y. Tsiang 10242.*—KWANGSI: *S. K. Lee 81273; W. T. Tsang 22818, 23173; H. Y. Liang 67412.*—KWEICHOW: *Y. Tsiang 4659, 4993, 4995, 5780, 5961, 6296, 7751; S. Y. Teng 1408, 10636.*

This species is one of the few characterized by pubescent ovaries and fruit. In the flower the ovary is silky villous and possesses an elongated style which is connate for part its length. Upon maturity the fruit, unlike its near relative *E. trichocarpa*, does not become glabrescent but possesses longish straggling hairs. The leaves are subsessile and are arranged distichously on the stem. *Eurya distichophylla* was based on male flowers. The female flowers were described under *E. Swinglei* by Merrill and at the time thought to belong to a new species.

21a. **Eurya distichophylla** Hemsley var. **Henryi** (Hemsley), comb. nov.

Eurya Henryi Hemsley in Hooker's Icon. **28**: sub t. 2761(1903).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: China (Yunnan).

CHINA. YUNNAN: mountains to the east of Mengtze, alt. 2135 m., *A. Henry 11348* (isotype of *E. Henryi*, AA, NY); *H. T. Tsai 51563, 51682, 62650; Y. Tsiang 13253.*

This variety, originally described as *E. Henryi*, can be distinguished from *E. distichophylla* only by its glabrous calyx. From the material examined, it seems to be confined to the state of Yunnan.

22. **Eurya ciliata** Merrill in Philipp. Jour. Sci. **23**: 253 (1923); in Lingnan Sci. Jour. **5**: 130(1927).

Eurya patentipila Chun in Sunyatsenia, **2**: 56(1934); in Hu & Chun, Icon. Pl. Sin. **5**: 6, pl. 206(1937).—**Syn. nov.**

DISTRIBUTION: China (Hainan, Kwangtung, Kwangsi).

CHINA. HAINAN: Ng Chi Leng, *F. A. McClure 9319* (holotype, NY), April 28, 1922; *N. K. Chun 44009, 44048; W. T. Tsang & H. Fung 643; H. Fung 20184; C. Wang 33508, 34527; H. Y. Liang 62272, 62278, 62618, 64701, 65339; F. C. How 71984, 73311, 73754.*—KWANGTUNG: shrub in thickets, *S. P. Lo 50831* (isotype of *E. patentipila*, AA), Nov. 10, 1930; *C. Wang 31149, 32122, 33001, 33013.*—KWANGSI: *R. C. Ching 7126; W. T. Tsang 22852; H. Y. Liang 67402; Kwangsi Museum 178.*

The young branchlets are densely covered with long spreading silky yellowish hairs becoming glabrescent with age. The leaves are coriaceous, short-petioled or subsessile, oblong-lanceolate, 5–9 cm. long, 2.0–2.5 cm. wide, rounded-oblique at the base, minutely cordatulate, gradually acuminate at the apex, densely long-pilose pubescent on the midrib with the veins obscure on both surfaces. The fruit (fide Chun) is ovoid-globose, 4.0–5.5 mm. long, scattered pilose. The style is glabrous, 4 mm. or more long, usually 4-fid, filiform, free. The calyx and ovary are densely pubescent.

In comparing the types of *E. ciliata* and *E. patentipila*, no differences could be found to possibly distinguish them as separate species.

23. **Eurya strigillosa** Hayata in Jour. Coll. Sci. Tokyo, **25**: Art. 19. 61(1908).—Kanehira, Formos. Trees, 57, f. (1917).—Yamamoto in Sylvia, **5**: 42, f. 33(1934).—Makino & Nemoto, Fl. Japan, ed. 2, 743(1931).

DISTRIBUTION: Formosa.

FORMOSA: *R. Kanehira 2933, 21187; U. Faurie 288, 1325.*

In pubescence and leaf-shape this species is very similar to *E. ciliata* of Hainan and Kwangtung. The ovary and fruit are invested with stiff hairs. Here it resembles also *E. gnaphalocarpa* and *E. trichocarpa*. However, unlike the last two species, whose stems are glabrous or nearly so, *E. strigillosa* has strong strigillose hairs along the branchlets and on the terminal bud.

24. **Eurya gnaphalocarpa** Hayata, Icon. Pl. Formos. **8**: 7, f. 5(1919).—Yamamoto in Sylvia, **5**: 40, f. 27(1934).

DISTRIBUTION: Formosa, Philippine Islands.
FORMOSA: *U. Faurie 1328*, in part; *E. H. Wilson 10845*.
PHILIPPINE ISLANDS. LUZON: *M. Ramos 76998*.—SABTANG: *M. Ramos 79879*.

Resembling *E. trichocarpa* in its pubescent ovary, this species differs in leaf characters and floral parts. In *E. trichocarpa* the leaves are somewhat narrower and taper off abruptly at first and then are drawn out more finely to an attenuate apex. In this species the apex is less attenuate and the tapering off is very gradual. In the male flowers, a rudimentary, pilose ovary is present. This species was confined formerly to Formosa but in this study the range has been extended south through Sabtang Island to Cayayan Province, Luzon.

25. **Eurya leptophylla** Hayata, Icon. Pl. Formos. **9**: 5, f. 4(1920).—Yamamoto in Sylvia, **5**: 41, f. 30(1934).—Suzuki in Ann. Rept. Taihoku Bot. Gard. **1**: 158(1931).

DISTRIBUTION: Formosa.
FORMOSA: *E. H. Wilson 9868, 10938; U. Faurie 289, 291, 1214, 1330, 1338; R. Kanehira 21198*.

The leaves in *E. leptophylla* are small for the genus, being 3–3.5 cm. × 1–1.5 cm. At the same time they are quite membranaceous and oblong-lanceolate. The male flowers have 7–8 stamens and the styles in the female flowers are columniform; these may or may not split to near the base.

26. **Eurya crenatifolia** (Yamamoto), comb. nov.

Pseudocurya crenatifolia Yamamoto in Jour. Soc. Trop. Agric. **5**: 351(1933); in Sylvia, **5**: 43, f. 36(1934).

DISTRIBUTION: Formosa.

FORMOSA: in monte Taiheizan, *S. Suzuki s.n.* (fragment of paratype, AA); *T. Tanaka & Y. Shimada 17764; E. H. Wilson 10177; J. L. Gressitt 420.*

Yamamoto first described this species under the genus *Pseudocurya*. The outstanding feature of this new *Eurya* was the pentandrous male flowers. This character, unusual perhaps for Formosan euryas, is quite prevalent in the genus throughout the Pacific Islands, especially in New Guinea and the Fiji Islands, and alone is not worthy of generic status. However, this opinion is now shared with the original author who discussed this situation with me during his recent visit to this Arboretum. At the same time, he kindly gave me a fragment of one of the paratypes for the species.

The female flowers have very short styles and in fruit these persistent styles seem almost non-existent, the stigmas curving immediately away from the fruit.

Closely allied to this species is *E. leptophylla*. However, in the latter species the styles are longer and the stamen number is 7–8. The leaves are generally larger, more membranaceous and attenuate at the apex.

27. **Eurya yaeyamensis** Masamune in Jap. Soc. Pres. Landsc. Hist. Nat. Mon. **8**: 24(1933); in Trans. Nat. Hist. Soc. Formosa, **24**: 209(1934).

DISTRIBUTION: Liu Kiu Islands (Iriomote).

LIU KIU ISLANDS. IRIOMOTE: *R. Kanehira 3148* (isotype, NY), Dec. 30, 1933; jungle stream, alt. 100 m., *J. L. Gressitt 587*, Aug. 1934 (shrub 4 m.).

In drawing up his original description, Masamune neglected to stress a few points which are given here. The leaf size is 8.0–12.0 cm. long, 3.0–4.0 cm. wide. He states that the petiole is 4 mm. long. In the specimens studied here, the petiole is found to be as much as 10 mm. long. Masamune also states that there are six sepals, rarely five or seven. I find five sepals in all the flowers dissected. Also, instead of "about 16 stamens" as found by Masamune, I find the general number of twenty.

This species seems to be a gigantic *E. zigzag*. Unfortunately, I have not had a chance to study *E. zigzag*. Masamune recently, in discussing the genus with me, offered to send typical material of this species along with other representative

material from the Liu Kiu Islands. This will form the basic material for a supplementary study of *Eurya* in these interesting islands.

28. **Eurya zigzag** Masamune in Jour. Soc. Trop. Agric. **2**: 48 (1930).

DISTRIBUTION: Liu Kiu Islands.
NO SPECIMEN EXAMINED.

This species, although not studied from actual material, is undoubtedly one of good standing. Actual specimens will be received for study from Masamune when the genus as represented on the Liu Kiu Islands will be studied. It resembles very much *E. yaeyamensis* Masamune. The zigzag and winged stems and branchlets are common to both. The leaves in *E. zigzag* are oblong to oblong-lanceolate and the size 8 × 2.25 cm. These are considerably smaller than the leaves of *E. yaeyamensis*. *Eurya zigzag* has 10 stamens which are 3 mm. long, with anthers twice the length of the filaments. *Eurya yaeyamensis* has 20 stamens which are 6 mm. long, with the filaments twice as long as the anthers.

29. **Eurya glaberrima** Hayata, Icon. Pl. Formos. **8**: 8, f. 6(1919).—Yamamoto in Sylvia, **5**: 39, f. 26(1934).—Suzuki in Ann. Rept. Taihoku Bot. Gard. **1**: 158(1931).

DISTRIBUTION: Formosa.
FORMOSA: *S. Suzuki 2558; J. L. Gressitt 416; E. H. Wilson 9717, 10914; R. Kanehira 2911; R. Kanehira & S. Sasaki 32, 21713; H. H. Bartlett 6343; U. Faurie 287, 290.*

This species is characterized by probably one of the shortest styles in *Eurya*. Hayata describes the style as being 0.25 mm. long. The calyx, style and stigma (fide Hayata) are purple in the pistillate flower. The leaves are coriaceous, linear-lanceolate, 6–8 cm. long, 1–2 cm. wide, slightly emarginate, finely but sharply serrate. As the name signifies the whole plant is "very" glabrous.

30. **Eurya Hayatai** Yamamoto in Jour. Soc. Trop. Agric. **5**: 348(1933); in Sylvia, **5**: 40, f. 28(1934).

DISTRIBUTION: Formosa.
FORMOSA: *E. H. Wilson 9809, 10882.*

The veining on the leaves, except for the midrib, is obscure. This smooth, seemingly unveined leaf surface is one of the outstanding features of the species. Also on the revolute or near-revolute margins, the serration is so finely crenate that the appearance of entirety is given in most cases. The whole plant, even to the terminal bud, is glabrous.

31. **Eurya japonica** Thunberg, Nov. Gen. Pl. 68(1783); Fl. Jap. 191, pl. 25(1784).—Lamarck, Encycl. Méth. Bot. **2**: 440(1788); Tabl. Encycl. Méth. **2**: 521, pl. 401(1793).—DeCandolle, Prodr. **1**: 525(1824).—Hooker & Arnott, Bot. Beech. Voy. 260(1836–40).—Siebold & Zuccarini in Abh. Akad. Münch. **4²**: 163 (Fl. Jap. Fam. Nat. **1**: 55)(1845).—Blume, Mus. Bot. Lugd.-Bat. **2**: 105(1856).—Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 14(1866); Prol. Fl. Jap. 202(1867).—Franchet & Savatier, Enum. Pl. Jap. **1**: 57(1875).—Ito & Kaku, Fig. & Descript. Pl. Koishikawa Bot. Gard. Tokyo, **2**: pl. 19(1883).—Y. Tanaka, Useful Pl. Jap. 164, pl. 663(1895).—Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893).—Ito & Matsumura in Jour. Coll. Sci. Tokyo, **12**: 326(1900).—Matsumura & Hayata in Jour. Coll. Sci. Tokyo, **22**: 46(1906).—Hayata in Jour. Coll. Sci. Tokyo, **25**: Art. 19, 60(1908).—Shirasawa, Ic. Ess. For. Jap. **2**: pl. 53(1908).—Schneider, Ill. Handb. Laubholzk. **2**: 329, f. 611 (f–k²)(1912).—Rehder & Wilson in Sargent, Pl. Wilson. **2**: 398(1915).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148 (1925).—Makino & Nemoto, Fl. Japan, ed. 2, 742(1931).—Yamamoto in Sylvia, **5**: 40, f. 29(1934).

Eurya uniflora Siebold ex Siebold & Zuccarini in Abh. Akad. Münch. **4²**: 163 (Fl. Jap. Fam. Nat. **1**: 55)(1845), *nomen nudum*.

Eurya hortensis Siebold, l.c. (1845), *nomen nudum*.

Eurya montana Siebold, l.c. (1845), *nomen nudum*.—Mueller in Walpers, Ann. Bot. Syst. **4**: 342(1857).

Eurya japonica Thunberg var. *uniflora* Blume, Mus. Bot. Lugd.-Bat. **2**: 106 (1856).

Eurya japonica Thunberg var. *montana* Blume, l.c. (1856).

Eurya japonica Thunberg var. *hortensis* Blume, l.c. (1856).

Eurya crispa Siebold ex Blume, l.c. (1856), pro synon. *E. japonica* var. *hortensis* forma *b*.

Eurya japonica Thunberg var. *pusilla* Blume, l.c. 107(1856).

Eurya pusilla Siebold ex Blume, l.c. (1856), pro synon. *E. japonica* var. *pusilla*.

Eurya japonica Thunberg var. *multiflora* Miquel in Ann. Mus. Bot. Lugd.-Bat. 3: 14(1866); Prol. Fl. Jap. 202(1867).

Eurya latifolia Hort. ex C. Koch, Dendrol. 1: 490(1869).

? *Eurya Jacquemartii* Carrière in Rev. Hort. (1869) 369, f. 79.—Quihou in Bull. Soc. Accl. Paris, sér. 2, 6: 472, f. 3(1869).

Eurya japonica a *Thunbergii* (non Thwaites) Ito & Matsumura in Jour. Coll. Sci. Tokyo, 12: 326(1900).—fide Nakai.

DISTRIBUTION: Japan, Korea, Formosa.

JAPAN: *E. H. Wilson 6166, 6130, 6212, 6250, 6302, 7810; C. S. Sargent s.n.; E. Oldham 92, 139; Z. Tashiro s.n.; C. L. Blume s.n.; K. Sakurai s.n.; C. J. Maximowicz s.n.; T. Tanaka s.n.; S. Arimoto s.n.; G. Masamune s.n.*

LIU KIU ISLANDS: *E. H. Wilson 8136; R. Kanehira 3364; H. Mayr s.n.; C. Wright 29.*

FORMOSA: *R. Kanehira 3137; U. Faurie 492, 494, 1645; E. Taquet 2687, 2688, 2689; C. Wilford s.n.; E. H. Wilson 9366, 9442.*

There has been considerable confusion over the identity of this species. From the material at hand, the range of distribution is rather confined, having been collected only in Japan, the adjacent northern Liu-Kiu Islands, Korea and Quelpaert Island. Early in its history the geographical range (due to a confusion of species) was extended erroneously to include nearly all states of China, India, Malaysia and even the Oceanic Islands. This erroneously determined material belonged mostly to *E. nitida* and since this latter material was more plentiful, nearly all subsequent determinations of *E. nitida* made by comparison were incorrectly called *E. japonica*. The real basis of relationship between these species is the extreme glabrous condition throughout the plant, even to the leaf-buds. The outstanding distinguishing character of *E. japonica* other than its glabrosity is its smooth leaf serrations along with its emarginate apex.

Undoubtedly there are various garden forms of this species. The only variety treated in this paper is *E. japonica* var. *microphylla*. Of the others no material is available for study, and mention of these variations in literature is seldom made. Of *E. Jacquemartii* no material has been seen. However, the fact that its origin is listed as Japan and also since the inadequate description does state that the serration is undulate, a detail brought out in the rough illustration, I feel quite certain that

it is straight *E. japonica* or one of the forms of this diversified species. It is listed in this paper as a synonym rather than as a dubious species.

Ito & Kaku, in 'Fig. and Descript. Pl. Koishikawa Bot. Gard. Tokyo **2**: t. 19(1883),' say that in the mountains where this species is abundant, the odor is so strong (disagreeable) at the time of flowering as to make one feel quite uncomfortable. E. H. Wilson also spoke of this strong, unpleasant odor. Ito remarks that the fruit is usually black, sometimes white, however—and a solution made from the ash of the tree is used as a mordant in dyeing.

31a. **Eurya japonica** Thunberg var. **microphylla** (Siebold) Blume, Mus. Bot. Lugd.-Bat. **2**: 107(1856).—Makino & Tanaka, Man. Fl. Nippon, 357(1927).

Eurya microphylla Siebold ex Siebold & Zuccarini in Abh. Akad. Münch. **4**[3]: 163 (Fl. Jap. Fam. Nat. **1**: 55)(1845), *nomen nudum*.

Eurya japonica Thunberg f. *θ. pumila* Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 14(1886); Prol. Fl. Jap. 202(1867).

Eurya pumila Siebold ex Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 14(1866); Prol. Fl. Jap. 202(1867), pro. synon. *E. japonica* var. *pumila*.

DISTRIBUTION: Japan (cultivated).

JAPAN: cultivated in garden, Nagasaki, *C. J. Maximowicz s.n.*

This variety, like the species, is strictly glabrous even to the terminal bud. The leaves are oblong-obovate, 1.0–2.0 cm. long, ca. 0.5 cm. wide. The apex is blunt and rounded. The serrated margin is similar to that of the species but in the variety, because of the minute size of the leaves, the serrations (6–12 for whole leaf) appear more sharp. This variety can easily be separated from *E. emarginata* var. *microphylla* whose leaves are suborbicular, deeply emarginate, less than 1 cm. long, and whose branchlets are puberulent.

32. **Eurya rengechiensis** Yamamoto in Jour. Soc. Trop. Agric. **5**: 55(1933); in Sylvia, **5**: 41, f. 32(1934).

DISTRIBUTION: Formosa.

FORMOSA: Rengechi, Prov. Taichu, *Y. Yamamoto & K. Mori s.n.* (type; fragment, AA), Nov. 2–3, 1932.

This is probably the most robust species found in Formosa. The leaves are oblanceolate, 7–8 cm. long, 2.5–3.5 cm. wide; the

widest leaf of the genus in Formosa. The revolute margin is minutely serrulate giving an entire appearance. There are 12–15 pairs of veins which are attached to the midrib at an angle of 60 degrees. These veins are deeply impressed on the upper surface and raised on the lower surface.

A fragment of the type was graciously given the author by Dr. Yamamoto during his recent visit to the Arboretum.

33. **Eurya amplexicaulis** S. Moore in Jour. Bot. **37**: 168 (1899).—Merrill, Enum. Philipp. Fl. Pl. **3**: 74(1923).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148 (1925).

Eurya auriculata Elmer, Leafl. Philipp. Bot. **2**: 501(1908).

DISTRIBUTION: Philippine Islands (Mindoro, Negros).

PHILIPPINE ISLANDS. MINDORO: Mt. Dulangau, *J. Whitehead s.n.* (holotype; photo. AA); Mt. Halcon, *E. D. Merrill 545*, Nov. 1906.—NEGROS: Dumaguete (Cuernos Mts.), *A. D. E. Elmer 9544* (isotype of *E. auriculata*, AA, NY), March 1908.

This species stands out from all other species in the Philippines because of its sessile, clasping, auriculate leaves. The only other species similar to it in the whole genus is *E. amplexifolia* Dunn which is found in Kwangtung.

34. **Eurya buxifolia** Merrill in Philipp. Jour. Sci. Bot. **5**: 362(1910); Enum. Philipp. Fl. Pl. **3**: 74(1923).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: Philippine Islands (Luzon).

PHILIPPINE ISLANDS. LUZON: *M. S. Clemens 17199; M. Ramos (Bur. Sci. no.) 5834; A. D. E. Elmer 8802; J. K. Santos (Bur. Sci. no.) 31719; E. Quisumbing & M. Sulit (Bur. Sci. no.) 32343; M. Ramos & G. Edano (Bur. Sci. no.) 37675; W. Klemme (For. Bur. no.) 5674.*

This species is confined to the island of Luzon and is characterized by terete branches, pubescent terminal buds, small coriaceous leaves up to 2.5 cm. long, nearly sessile (petiole up to 1 mm.) and styles very short, free to the base. Its nearest relative is *E. flava.*

35. **Eurya flava** Merrill ex Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Frutex (probabiliter) vel arbor parva, ramis ramulisque

alatis, gemmis ultimis pubescentibus; foliis oblongo-ellipticis ad oblongo-ovatis apice acuminatis basin cuneatis 2.5–5.0 cm. longis et 1.2–2.3 cm. latis subtus fere flavo-viridibus, costis juvenilibus pubescentibus, marginibus serrulatis, petiolis 2–3 mm. longis; floribus ♀ axillaribus solitariis vel binis, pedicellis brevibus pubescentibus, calycibus pubescentibus; fructibus immaturis globosis 2 mm. latis, stylis 3 ad basin liberis persistentibus brevissimis 1 mm. longis.

DISTRIBUTION: Philippine Islands (Luzon, Sorsogon, Mindanao, Palawan, Leyte, Batan).

PHILIPPINE ISLANDS. LUZON: Benguet Subprov., *E. D. Merrill 1737* (type, NY, G), May 1914; *E. D. Merrill 4648; A. D. E. Elmer 5910, 6813, 8361, 8767, 22292; R. S. Williams 731, 1212; T. E. Borden 270; H. N. Whitford 1192; A. Loher 86; H. M. Curran & M. L. Merritt (For. Bur. no.) 7848; M. Dirige (Bur. Agr. no.) 18633; R. Meyer (For. Bur. no.) 2641; M. Vanoverbergh 324; R. M. Holman 23; M. Ramos & G. Edano (Bur. Sci. nos.) 37788, 37968, 45015.*—SORSOGON: *A. D. E. Elmer 16748; M. Ramos (Bur. Sci. no.) 77118.*—MINDANAO: *A. D. E. Elmer 11442; E. D. Merrill 6188.*—PALAWAN: *A. D. E. Elmer 13199.*—LEYTE: *M. Ramos (Bur. Sci. no.) 41553; C. A. Wenzel 895.*—BATAN: *M. Ramos (Bur. Sci. nos.) 80023, 80289, 80695.*

This species was first recognized by Merrill and given the herbarium name *Eurya flava.* However, no description of the species was ever published by Merrill. Melchior, in working up the Theaceae for Engler & Prantl, 'Nat. Pflanzenfam.' (see above), mentions the species as though it were valid in a key to the Philippine euryas. The description in the present treatment is drawn from the actual specimens which were to have been used by Merrill for the types. This is done to avoid any further confusion. The flowers in the type specimens are too small for use in a detailed description, hence the following descriptions of the flowers are drawn from specimens other than the types. For the male flowers, *M. Ramos, no. 80289* is used: flowers axillary, single or in pairs, subtended by 2 small obtuse bracts, pedicel up to 3 mm. long, pubescent; calyx with 5 imbricated sepals, coriaceous-membranaceous at margin, 3.5 mm. long, 2 mm. wide; corolla of 5 obovate petals, rounded at apex, 4.5–5.0 mm. long, 3 mm. wide; stamens ca. 20, anthers 1 mm. long, filaments twice the anther length. For the female flowers, *Ramos & Edano no. 37788* is used: flowers axillary, single or in pairs, subtended by linear bracts 0.5 mm. long, pedicel pubes-

cent, up to 1.5 mm. long; calyx of 5 imbricated sepals, coriaceous, membranaceous at margin, 1.5 mm. long; corolla consisting of 5 petals, obtuse, rounded at apex, 2.0–2.5 mm. long, 1.5 mm. wide; ovary globose, glabrous, 1.2 mm. across, style trifid, 0.25 mm. long, free to the base.

36. **Eurya coriacea** Merrill in Philipp. Jour. Sci. Bot. **5**: 361 (1910); Enum. Philipp. Fl. Pl. **3**: 74(1923).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

Eurya pachyphylla Merrill in Philipp. Jour. Sci. Bot. **13**: 309(1918); Enum. Philipp. Fl. Pl. **3**: 74(1923).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).—**Syn. nov.**

Eurya pachyrachis Merrill in Philipp. Jour. Sci. Bot. **13**: 310(1918); Enum. Philipp. Fl. Pl. **3**: 74(1923).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).—**Syn. nov.**

DISTRIBUTION: Philippine Islands (Luzon).

PHILIPPINE ISLANDS. LUZON: *M. Ramos & G. Edano (Bur Sci nos.) 26525* (isotype of *E. pachyphylla*, NY, AA), *26579* (isotype of *E. pachyrachis*, AA), *28473, 33310, 38092, 40456, 45693; M. Ramos (Bur. Sci. nos.) 5598, 23565; G. Edano (Bur. Sci. no.) 75951; A. D. E. Elmer 8642; H. M. Curran, M. L. Merritt & T. C. Zschokke (For. Bur. no.) 18052.*

This species, confined to the island of Luzon, is characterized by terete stems, glabrous throughout, glabrous terminal buds, very short styles free to the base, and coriaceous or subcoriaceous leaves. *Eurya pachyrachis* was based primarily on a peculiar formation of the pedicel bases of the flowers, evidently persistent from season to season and was interpreted as a racemose inflorescence. This condition is found in other species of *Eurya* and often on an occasional specimen. In other respects it is a true *E. coriacea*. *Eurya pachyphylla* was originally separated from *E. coriacea* by its shorter petioles and glabrous sepals. Occasionally some of the sepals of *E. coriacea* are ciliate. However, this does not hold true for all specimens in the species.

37. **Eurya Pickeringii** A. Gray, Bot. U. S. Expl. Exped. 1838–1842, **1**: 211(1854).—Mueller in Walpers, Ann. Bot. Syst. **4**: 348(1857).

DISTRIBUTION: Samoa.

SAMOA: on mountains, Tuituila, alt. 600 m., *U. S. South Pacific Expl. Exped. 1838–1842 s.n.* (type, G); Asama, back of Sologa, Savaii, *F. Vaupel 372*, Aug. 18, 1905.

This species, along with *E. Richii* and *E. vitiensis*, is poorly represented in western herbaria. Even though possessing the types, the specimens are so poor that it is difficult to recognize relationships. A. Gray uses this species and the following species as a basis for his subgenus Euryodes based on the pentandrous staminate flowers. This character is hardly sufficient for sectional delimitation since one finds all numbers of stamens varying from 5 to 10 to 15 etc. One would find it necessary to make a subgenus for each stamen group to correspond with Gray's 5-stamened section, and this would not be feasible.

38. **Eurya Richii** A. Gray, Bot. U. S. Explor. Exped. 1838–1842, 1: 212(1854).—Mueller in Walpers, Ann. Bot. Syst. 4: 348(1857).

Eurya sanguinea Vesque in Bull. Soc. Bot. France, 42: 159(1895).

DISTRIBUTION: Samoa.

SAMOA: Upolu, *C. Pickering s.n.* (type G; isotype NY); *S. J. Whitmee s.n.; Betche s.n.* (type of *E. sanguinea;* photo. and fragment, AA).

Like *E. Pickeringii*, this species is characterized by pentandrous staminate flowers. The main character of separation from *E. Pickeringii*, which is found on the same island, is its pubescence.

A photograph of the type specimen of *E. sanguinea* was examined. This examination coupled with a study of the description, showed *E. sanguinea* to be the pistillate counterpart of *E. Richii*.

39. **Eurya vitiensis** A. Gray, Bot. U. S. Explor. Exped. 1838–1842, 1: 210(1854).—Seemann, Fl. Vitiensis, 14(1865).—Anon. in Gartenfl. 36: 130(1887).

DISTRIBUTION: Fiji Islands.

FIJI ISLANDS: on the summit of a mountain of Ovolau, alt. 600 m., *U. S. South Pacific Expl. Exped. 1838–1842 s.n.* (type, G, NY); *B. Seemann s.n.; W. H. Harvey s.n.; J. Horne s.n.*

A. Gray in his original description writes of this species as being "very glabrous even to the ultimate branches." This is hardly correct. Even on the type specimen (determination in A. Gray's handwriting) pubescence is found on the terminal

buds, young stems and petioles. The species is further characterized by an ovoid, pointed ovary. Gray remarks that the anthers are cuspidate-pointed. This is often characteristic of species in the genus. No suitable flowers could be had for dissection.

40. **Eurya glabra** (Blume) Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 114(1840).—Blume, Mus. Bot. Lugd.-Bat. **2**: 109(1856).—De Vries, Pl. Ind. Bat. Orient. Reinw. 28(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 343(1857).—Miquel, Fl. Nederl. Ind. **1**[2]: 472(1859); in Ann. Mus. Bot. Lugd.-Bat. **4**: 104(1868–69).—Vesque in Bull. Soc. Bot. France, **42**: 153 (1895).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 240(1896).—Baker f. in Jour. Bot. **62**: suppl. 8(1924).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147 (1925).

Geeria glabra Blume, Bijdr. Fl. Nederl. Ind. **3**: 125(1825).

Eurya tristyla Wight & Arnott, Prodr. 86(1834).—Walpers, Repert. Bot. Syst. **1**: 369(1842).

DISTRIBUTION: Java.

JAVA: exact locality and collector uncertain (isotype G, NY; photo. and fragment, AA); *O. Warburg 3365; O. Kuntze 5746; H. S. Yates 2675.*

In 1825 Blume described this species as *Geeria glabra.* In the same publication *Geeria obovata* was also described by him. Later in 1842, Korthals transferred both species to *Eurya.* Strangely enough, although Korthals is credited with the binomial *Eurya obovata,* authors have ignored the other binomial, *Eurya glabra,* made at the same time by Korthals and have credited the changed name to Blume in his publication twelve years later, 1856. Even "Index Kewensis" has credited one combination to Blume and the other to Korthals.

41. **Eurya coneocarpa** Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 117(1840).—Walpers, Repert. Bot. Syst. **1**: 369 (1842).—Blume, Mus. Bot. Lugd.-Bat. **2**: 108(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 343(1857).—Miquel, Fl. Nederl. Ind. **1**[2]: 471(1859).—Vesque in Bull. Soc. Bot. France, **42**: 155 (1895).

Eurya japonica Thunberg var. *Thunbergii* Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 234(1896).—Non Thwaites, Enum. Pl. Zeylan. 41(1864).

Eurya japonica Thunberg var. *coneocarpa* Hochreutiner in Candollea, **2**: 434 (1925).

DISTRIBUTION: Java.

JAVA: locality lacking, *P. W. Korthals s.n.* (isotype, NY, G; photo. and fragment, AA); *O. Warburg 3364; H. S. Yates 2760; E. Meyer s.n.*

Eurya coneocarpa is characterized by unequal and alternate bracts, turbinate or top-shaped fruit (globose-ovoid) and flower buds quite conic in shape because of the abruptly acuminate calyx lobes.

Koorders & Valeton, in referring *E. coneocarpa* to *E. japonica* var. *Thunbergii*, definitely had true *E. coneocarpa* in mind. They refer to the young branchlets as "ramulis ultimis angulatis glabris," which is a true character. On the other hand, Thwaites describes the branches "ramulis teretibus glabris," which does not apply to this species.

42. **Eurya obovata** (Blume) Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 118(1840).—Walpers, Repert. Bot. Syst. **1**: 369(1842).—Blume, Mus. Bot. Lugd.-Bat. **2**: 107(1856).—De Vries, Pl. Ind. Bat. Orient. Reinw. 27(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 342(1857).—Miquel, Fl. Nederl. Ind. 1^2: 470(1859).—Vesque in Bull. Soc. Bot. France, **42**: 154 (1895).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 242(1896).

Geeria obovata Blume, Bijdr. Fl. Nederl. Ind. **3**: 125(1825).

Eurya reticulata Korthals in Temminck, Verh. Nat. Gesch. Bot. **3**: 118(1840).—Walpers, Repert. Bot. Syst. **1**: 369(1842).—Blume, Mus. Bot. Lugd.-Bat. **2**: 107(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 342(1857).—Miquel, Fl. Nederl. Ind. 1^2: 471(1859).—Baker f. in Jour. Bot. **62**: suppl. 9 (1924).—Merrill in Contrib. Arnold Arb. **8**: 107(1934).

Eurya obovata var. *elliptica* Blume, Mus. Bot. Lugd-Bat. **2**: 107(1856).—Mueller in Walpers, Ann. Bot. Syst. **4**: 342(1857).

DISTRIBUTION: Celebes, Java (fide Korthals), Sumatra, Borneo.

CELEBES: in monte Klabat, collector lacking (type; photo. and fragment, AA); on top of Lomphobatang, Gowa, alt. 2700–2850 m., *Neth. Ind. For. Service s.n.*, Sept. 9, 1935.

SUMATRA: locality and collector lacking (isotype of *E. obovata* var. *elliptica*, G); locality and collector lacking (isotype of *E. reticulata;* photo. and fragment, AA); *H. O. Forbes 2393.*

BORNEO. MT. KINABALU: *J. & M. S. Clemens 27883, 28990, 29881, 30347, 33108, 33789, 50813, 50879, 50986; M. S. Clemens 10634, 10666.*

Most of the recent workers have used the name *E. reticulata* rather than *E. obovata* when designating this species. These two names appeared under the genus *Eurya* simultaneously (1840) and on the same page. However, *E. obovata* (Bl.) Korthals is merely a transfer from the genus *Geeria* to *Eurya* and as such has precedence over the name *E. reticulata* which was appearing for the first time.

42a. **Eurya obovata** Korthals var. **sinaboengensis**, var. nov. A specie typica differt foliis oblongo-ellipticis.

DISTRIBUTION: Sumatra.

SUMATRA: wooded belt (light jungle) slightly below center of volcano Sinaboeng, alt. at peak 2550 m., *W. N. & C. M. Bangham 1180* (type, AA), Feb. 23, 1932 (shrub 3 m.; fruit green) (AA, NY); Deleng Si Naboen (ascent from Kampong Goeroe Kinajan), Karoland, *H. H. Bartlett 8650*, June 25–26, 1927.

This variety found on the slopes of the volcano Sinaboeng (Si Naboen) resembles *E. obovata* in all respects except leaf shape. Instead of being obovate, rounded-obtuse, the leaves of the variety are oblong-elliptic, tapering at both ends.

43. **Eurya Roemeri** C. Lauterbach in Nova Guinea, 8[4]: 842 (1912).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 21: 148(1925).

DISTRIBUTION: New Guinea.

NEW GUINEA: lowlands of the Hellwig Mts., Dutch New Guinea, 750 m., *L. von Roemer 848* (type; photo. and fragment, AA), Nov. 1909.

Lauterbach described this species quite completely and stated that the female flower possessed 3 styles and 3 stigmas. In general appearance, *E. Roemeri* resembles more closely the haplostemonous group of New Guinea rather than the many-stamened group of the rest of the genus. One wonders how much material the author possessed in drawing up his description because the photograph of the type is a woefully poor specimen. Even so, from this fragmentary material it stands by itself as a species.

44. **Eurya Greenmaniana**, spec. nov.

Arbor parva, ramulis teretibus dense pilis fulvis adpressis vestitis; foliis coriaceis distichis ovatis 2.0–3.0 cm. longis et 0.7–1.0 cm. latis acuminatis basi rotundatis ad truncatis gla-

bris subtus sericeo-pilosis acute serratis, breviter petiolatis; floribus ♀ axillaribus 1–3, sepalis 5 inaequalibus 1.0–1.5 mm. longis, petalis albidis inaequalibus 3 mm. longis 2 mm. latis, ovario globoso glabro, stylis 3 brevibus ad basin liberis, stigmatibus truncatis; fructu ignoto.

DISTRIBUTION: New Guinea.

NEW GUINEA. BRITISH NEW GUINEA: common at fringes and interior of forests, Murray Pass, Wharton Range, Central Distr., alt. 2840 m., *L. J. Brass 4744* (type, AA), June–Sept. 1933.

Small tree of open-branching habit, branchlets terete, stiff, same diameter throughout, not tapering as is usually the case. The young branchlets and leaves are clothed with a dense fulvous somewhat appressed pilose pubescence. The older leaves are quite glabrous except on the midrib, coriaceous, distichous, ovate, rounded or truncate at the base, acute at the apex, sharply serrate, very short-petiolate or subsessile. The female flowers are found singly or in clusters of two or three in the axils of the leaves. These are bi-bracteolate. The ovary is quite globose, glabrous, topped by a short trifid style, free to the base.

This interesting species is quite distinct from most Papuan species. It resembles more the distichous species of China, especially *E. disticha* from which it differs in having the style and stigma 5-parted instead of 3-parted and its leaves with rotund base, acuminate apex and sharp serration.

It is a pleasure to name this species in honor of Dr. Jesse More Greenman, long a loyal friend and advisor.

Subgenus PENTEURYA

Eurya subgenus **Penteurya**, subgen. nov.

45. **Eurya Hellwigii** Lauterbach in Nova Guinea, 8[4]: 841 (1912).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925).

DISTRIBUTION: New Guinea.

NEW GUINEA: summit of the Hellwig Mts., Southwest New Guinea, alt. 2500 m., *L. von Roemer 1249* (type; photo. in AA), Nov. 1909; common on forest fringes, Mt. Albert Edward, Central Division, British New Guinea, alt. 3680 m., *L. J. Brass 4264*, May–July, 1933 (tree, 3–5 m., with stiff spreading branches; branchlets reddish; leaves yellowish beneath; flowers white).

Lauterbach in his original description says that the styles in this species are trifid. In dissections on the flowers of *Brass 4264* there are five distinct stigmas and the styles are 5-fid. This may intimate that the Brass specimen is perhaps a new species. However, in all other respects it agrees with this species. I feel that had Lauterbach possessed better material he would have discovered, perhaps, the parts of the female flower in fives rather than threes, since this is the condition found in most of the New Guinea species.

46. **Eurya albiflora** White in Proc. Roy. Soc. Queensland, 39: 66, pl. 4, fig. 2(1928).

Eurya oreogena Diels in Bot. Jahrb. 62: 483(1929).—Syn. nov.

DISTRIBUTION: New Guinea.
NO SPECIMENS EXAMINED.

Even though no specimens of this species and *E. oreogena* were examined, the descriptions given by the two individual authors, White and Diels, were so well drawn up that it is quite evident that the species is quite distinct and also that both authors had the same species in mind. White described *E. albiflora* one year previous to Diels' *E. oreogena*. Accompanying White's description is an excellent plate. The only discrepancy in the descriptions is found in the number of stamens. White describes *E. albiflora* as having 5 stamens while Diels says that *E. oreogena* has 8–9. Probably there may be a variation in stamen number in the species.

I am of the opinion that the types of both species were collected at the same locality. *Eurya oreogena* was collected at Saruwaged-Gebirge in Northwest New Guinea at 12000 ft., while *E. albiflora* was collected at Sarawaket at 10000 ft.

There is a great resemblance between this species and *Eurya Hellwigii*. However, *E. albiflora* is much more densely pubescent, in fact tomentose, than *E. Hellwigii*. Also the leaf-base in *E. albiflora* is cordate (fide author), while that of *E. Hellwigii* is cuneate or subrotund. The leaves in this species, according to White, are 1.0–1.7 cm. long, decidedly smaller than *E. Hellwigii*. It is assumed that the style of *E. albiflora* is five-fid because of the number of stamens and its relation to other New

Guinea species. This assumption may prove erroneous when female flowers are found and examined.

47. **Eurya Merrilliana**, spec. nov.

Arbor vel frutex 3–5 m. altus, ramis initio pilosis demum glabratis; foliis ovatis 4–6 cm. longis et 2–3 cm. latis coriaceis abrupte acuminatis, acumine emarginato, basi cuneatis supra glabris subtus pilosis serratis venis elevatis perpendicularibus 10–12 paribus, breviter petiolatis, petiolis 2–3 mm. longis; floribus ♂ axillaribus solitariis raro geminatis, pedicellis 3–4 mm. longis; sepalis 5, petalis 5 albidis inaequalibus, staminibus 5; floribus ♀ ovario globoso glabro, stylis connatis, stigmatibus 5; fructibus baccatis glabris globosis.

DISTRIBUTION: New Guinea.

NEW GUINEA. BRITISH NEW GUINEA: common in forest fringe growth, Murray Pass, Wharton Range, Central Division, alt. 2840 m., *L. J. Brass 4660* (type, AA), June–Sept., 1933 (small tree 3–5 m. with smooth shining leaves, white flowers and slightly compressed, purple fruit); same general locality, alt. 2840 m., *L. J. Brass 4575*, June–Sept. 1933 (small tree or large bush, 2–4 m.; flowers white).

Four normal stamens plus one double stamen make a most interesting character in this species. In all flowers examined this same condition existed. In the double stamen the two filaments were connate the entire length topped by two individual anthers. In the female flowers the style is almost nil. Very short, less than 1 mm., it is topped by five stigmas.

The leaves are shining-smooth, heavy-coriaceous, ovate, 4–6 cm. long, 2–3 cm. wide, tapering very abruptly at both ends, emarginate, sparingly pubescent on lower surface, short-petioled. The terminal leaf-buds and midrib are very hirsute, covered with tan pubescence. The stems are gray, pubescent when young and terete.

It is a pleasure to name this distinct and interesting species in honor of Dr. E. D. Merrill, Director of the Arnold Arboretum, ardent worker in the Pacific Islands flora and a scientist whose interest and assistance in the study of this genus have been most helpful.

48. **Eurya tigang** Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, 447(1901).—Diels in Bot. Jahrb. **57**: 434

(1922).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 21: 148(1925).

DISTRIBUTION: New Guinea.

NEW GUINEA: Sattelberg, Kaiser Wilhelm Land, *Bamler 24* (type; photo. and fragment, AA), Dec. 24, 1898.

When originally described only male plants were available. Later Diels amended the description (1922) by describing the female flowers, showing that this species, like several others of New Guinea, have an increased number of stigma and style parts (5). The stamen number in this species is five.

The leaves are oblong, linear-lanceolate, 4–12 cm. long, 1.5–3.2 cm. wide, very short or obtusely acuminate at the apex and rounded at the base, coriaceous, entire, rust-colored pubescent below, glabrous above, subsessile with hairy petiole 1.0–2.0 mm. long. Usually there is one, rarely two flowers in the axil. Tree ten meters high.

49. **Eurya meizophylla** (Diels), comb. nov.

Eurya tigang Schumann & Lauterbach var. *meizophylla* Diels in Bot. Jahrb. 57: 434(1922).

DISTRIBUTION: New Guinea.

NEW GUINEA: wooded mountains, Lordberg, Kaiser Wilhelm Land, alt. 1000 m., *C. Ledermann 9981* (type; photo. and fragment, AA) (slender tree 15–20 meters with brown bark, white flowers and dark green leaves).

The differences between this species and *E. tigang* are enough to warrant specific ranking. *Eurya meizophylla* has larger, oblique leaves, tapering considerably to a very fine apex, distinctly cuneate at the base and according to my specimen glabrous. *Eurya tigang,* on the other hand, has smaller leaves, although acuminate, bluntly so, quite rounded at the base and quite pubescent on the under surface. The veining of the latter is nearly at a right angle to the midrib while that in *E. meizophylla* is more nearly at a forty-five degree angle and is more sweeping.

The leaves are somewhat oblique, membranaceous, 10–13 cm. long, 3.5–4.5 cm. wide, gradually diminishing at the apex, a little hairy at the bud.

50. **Eurya leptantha** Diels in Bot. Jahrb. **57**: 433(1922).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148 (1925).

DISTRIBUTION: New Guinea.

NEW GUINEA: mountain forest, Schraderberg, Sepik-Terr., Kaiser Wilhelm Land, alt. 2070 m., *C. Ledermann 12201* (type; photo. and fragment, AA) (tree 8–10 m. with dark brown bark; leaves shiny, dark green, gray-green beneath; flowers white).

This species, studied only from the photograph and fragment of the type, is outstanding among the New Guinea euryas in that its leaves are distinctly membranous. It has five stamens and five styles, the latter joined (fide Diels) to the middle. The branchlets are lax, not firm and the leaves are lanceolate or lance-oblong (4.0–5.5 cm. long, 1.0–1.5 cm. broad), unequal at the base and long-acuminate at the apex.

51. **Eurya Rehderiana**, spec. nov.

Arborescens ramis teretibus glabris; foliis coriaceis glabris obovatis vel ellipticis 9–10 cm. longis et ca. 3 cm. latis subito acuminatis basi cuneatis margine revolutis integris apice acuminato serrato excepto, petiolis crassis 4–5 mm. longis; fructibus baccatis globosis 5–6 mm. longis et 4–5 mm. latis glabris, stylis brevissimis 5-fidis persistentibus, stigmatibus 5.

DISTRIBUTION: New Guinea.

NEW GUINEA. BRITISH NEW GUINEA: common in forests of lower slopes of Mt. Tafa, Central Division, alt. 2400 m., *L. J. Brass 5073* (type, AA), May-September 1933.

Slender tree 10–15 m. high. Branches terete, reddish-brown while young, grayish when older, glabrous. Leaves thick, coriaceous, glabrous even to bud, obovate to elliptic. 9–10 cm. long, approximately 3 cm. wide, abruptly acuminate at apex, emarginate, serrate at the tapering apex, entire otherwise; petiole stout, 3–5 mm. long. Fruit globose, numerous, dark purple, 5–6 mm. long, 4–5 mm. broad, borne singly or in clusters of 2–3 along the stem, pedicels up to 5 mm.

This new species resembles *Eurya phyllopoda* (Diels) in general form. However, it is separated from this New Guinean species by its entirely glabrous condition as contrasted to

the pubescent leaves and leaf-buds of the latter. Also *E. phyllopoda* is finely serrate along the whole leaf; *E. Rehderiana*, on the other hand, is serrate only at the acuminate apex. The apex of *E. phyllopoda* is acuminate and tapers to a very fine point while *E. Rehderiana* tapers less finely and is emarginate.

It is a pleasure to name this species in honor of Prof. Alfred Rehder, Curator of the Herbarium, Arnold Arboretum. Long a recognized authority on the ligneous flora of the Orient, his interest and helpful criticism in this study are gratefully appreciated.

52. **Eurya oxysepala** Diels in Bot. Jahrb. **57**: 435(1922).—Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148 (1925).

DISTRIBUTION: New Guinea.

NEW GUINEA. KAISER WILHELM LAND: Sepik Terr., Schraderberg, mountain forest, alt. 2070 m., *C. Ledermann 11971* (type; photo. and fragment, AA), June 13, 1913 (tree 15–20 m.; flowers white; leaves shiny dark green with bright red petioles, young leaves yellowish-red; bark gray-brown).

This species in general appearance resembles *E. Rehderiana*. However, it can be easily distinguished by its leaves which are ovate rather than obovate, less coriaceous, not revolute and serrate along the whole margin. Also the pedicels on the fruit are shorter.

The leaves of *E. oxysepala* are 6–13 cm. long and 2–4 cm. wide, shining dark green, yellowish-red when young. The petiole is bright red.

53. **Eurya phyllopoda** (Diels), comb. nov.

Eurya tigang K. Schumann & K. Lauterbach var. *phyllopoda* Diels in Bot. Jahrb. **57**: 435(1922).

DISTRIBUTION: New Guinea.

NEW GUINEA. KAISER WILHELM LAND: Sepik Terr., rocky-peak, forest, alt. 1400–1500 m., *C. Ledermann 12752* (type; photo. and fragment, AA), Aug. 19, 1913 (tree 10–12 m. with greenish-white flowers and blue-black fruit; leaves bright shining green, almost white [fide collector] underneath).

Diels in describing *E. tigang* var. *phyllopoda* felt it was, perhaps, only a mature form of *Eurya tigang*. The very leathery leaves, along with the elongated petiole and the tapering base of the leaf, are all outstanding characters in this genus and

merit specific distinction. This species is much nearer the newly described *Eurya Rehderiana* found in British New Guinea. *Eurya phyllopoda* has very finely serrate leaves and leaf-buds which are closely strigose-silky, while *E. Rehderiana* is very glabrous even to the leaf-bud and entire except for the acuminate portion at the apex of the leaf.

DOUBTFUL OR LITTLE-KNOWN SPECIES

Eurya boninensis Koidzumi in Bot. Mag. Tokyo, **32**: 253 (1918).

No material has been available for the study of this species. Koidzumi remarks that it is closely allied to *E. chinensis* f. *macrophylla* but can be distinguished easily, since it is entirely glabrous. Floral descriptions are omitted and the style remnant is considered an apiculate portion of the capsule. This species, because of its glabrous condition, its crenate-serrate leaves and its distribution, probably belongs to E. *japonica* or is a close relative.

Eurya castaneifolia Vesque in Bull. Soc. Bot. France, **42**: 158(1895).

This species was described from a very fragmentary specimen collected by Hooker & Thomson in Khasia and deposited in the Paris Museum. Vesque, in his description, says that the plant is entirely glabrous. This is difficult to believe. The photograph of the type which I have examined shows there are no terminal buds. The stem instead of being angled—a character which is usually associated with glabrous terminal buds —is quite terete. I am of the opinion that the terminal buds, were they present, would be pubescent. The only glabrous relative from Khasia would be *E. nitida* Korthals. However, from general observation, the fragment appears more closely related to pubescent *E. acuminata* DC.

Eurya grandis Choisy in Zollinger, Syst. Verz. Ind. Archip. 147(1854).—Mueller in Walpers, Ann. Bot. Syst. **4**: 347(1857). —Miquel, Fl. Nederl. Ind. 1^2: 471(1859).—Koorders & Valeton, Bijdr. Boomsoorten Java, **3**: 246(1896).

Choisy, in his original description, states that *E. grandis* is

glabrous with terete branches and ovate-acuminate leaves. One would naturally place this species from this description under *E. glabra.* At the same time, however, Choisy remarks that the species is very closely related to *E. Blumeana, E. euprista* and *E. serrata,* all three synonyms of pubescent *E. acuminata.* Later Koorders & Valeton, although recognizing it as a valid species, mention that the species is pubescent. In this case the species in question might be united with *E. acuminata.*

Eurya muricata Dunn in Jour. Bot. **48**: 324(1910).

Doubt will hang over this species until the type can be located and studied. There is no record of *Dunn 877* (type) at Kew, and it has been suggested that the specimen may be in the herbarium of the Hongkong Botanical Garden. In the herbarium of the New York Botanical Garden is a supposed isotype. However, this specimen does not agree with the description of Dunn at all and one feels that probably there is an error in the label.

Eurya osimensis Masamune in Trans. Nat. Hist. Soc. Formosa, **25**: 249(1935).

The original description of this species is very inadequate. Leaf measurements were omitted and the author evidently had seen no flowers. The fruit was merely described as globose, a character which could apply to nearly all the species of *Eurya.*

Eurya rapensis F. Brown in Bernice P. Bishop Mus. Bull. no. **130**: 182, f. 26(1935).

My attention was drawn to this species very late in this study —too late in fact to obtain material. The author states that the species was collected on the island Rapa (southern Polynesia) and is closely "allied to *E. vitiensis* A. Gray from Fiji, from which it differs in the larger leaves [4–7 × 1–3 cm.], solitary flowers, 4–5-parted style, the presence of rudimentary stamens in the carpellate flowers and the larger fruits. Native name is *pooto* in Rapa."

Knowing how variable are the characters mentioned by Brown as limiting the species I am loath to accept or disregard the species until material can be had for study.

Eurya ryukyuensis Masamune in Trans. Nat. Hist. Soc. Formosa, **25**: 249(1935).

As in the case of *E. osimensis*, Masamune fails to give any outstanding characters in his description to separate the species from any number of other species of *Eurya*. He evidently lacked both staminate and pistillate flowers. The fruit, he describes, as axillary, very much like *E. japonica*. In fact, the whole description might well apply to *E. japonica*.

Eurya ternatana Miquel in Ann. Mus. Bot. Lugd.-Bat. **4**: 105 (1868–69).

Only a photograph of the type was available for study of the species. To draw any conclusions concerning this species was quite impossible, hence it must be placed here pending further study.

Eurya timorensis Zippel ex Spanoghe in Linnaea, **15**: 177 (1841), *nomen nudum*.

To my knowledge, the only citation of this species is the original. Spanoghe merely listed it and intimated that he had no knowledge of it.

Eurya yakushimensis (Makino) Makino in Bot. Mag. Tokyo, **27**: 72(1913).

Eurya japonica Thunberg var. *yakushimensis* Makino in Bot. Mag. Tokyo, **24**: 20(1910).

From the description, this species, first described by Makino as a variety and later raised to specific rank, seems nothing more than a narrow-leaved form of *E. japonica*. However, no authentic material has been available, hence the species must be placed here pending further study.

EXCLUDED SPECIES

Eurya albo-punctata (Grisebach) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147(1925). = **Ternstroemia albo-punctata** Grisebach.

Eurya angulosa (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera angulosa** Tulasne.

Eurya arbutifolia (Triana & Planchon) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera arbutifolia** Triana & Planchon.

Eurya Benthamiana (Bentham) Bullock in Kew Bull. Misc. Inform. **1936**: 391 (1936). = **Freziera integrifolia** Bentham, non *E. integrifolia* Blume.

Eurya boliviensis (Wawra) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera boliviensis** Wawra.

Eurya Bolleana O. C. Schmidt in Fedde, Rep. Spec. Nov. **33**: 177(1933). = **Freziera Bolleana** (O. C. Schmidt), comb. nov.

Eurya calophylla (Triana & Planchon) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera calophylla** Triana & Planchon.

Eurya candicans (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera candicans** Tulasne.

Eurya Cavaleriei Léveillé in Fedde, Rep. Spec. Nov. **9**: 450(1911). = **Symplocos laurina** (Retzius) Wallich.

Eurya cernua (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera cernua** Tulasne.

Eurya conocarpa O. C. Schmidt in Fedde, Rep. Spec. Nov. **22**: 98(1925). = **Freziera conocarpa** (O. C. Schmidt), comb. nov.

Eurya cordata (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera cordata** Tulasne.

Eurya Dombeyana (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera Dombeyana** Tulasne.

Eurya Ekmani O. C. Schmidt in Fedde, Rep. Spec. Nov. **22**: 97(1925). = **Freziera Ekmani** (O. C. Schmidt), comb. nov.

Eurya Esquirolii Léveillé, Fl. Kouy-Tchéou, 415(1915) *nomen nudum*. = **Litsea Kobuskiana** Allen.

Eurya ferruginea (Wawra) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera ferruginea** Wawra.

Eurya Friedrichsthaliana Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera Friedrichsthaliana** (Szyszylowicz), comb. nov.

Eurya Grisebachii (Krug & Urban) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 148(1925). = **Freziera Grisebachii** Krug & Urban.

Eurya guatemalensis Donnell-Smith in Bot. Gaz. **46**: 109(1908). = **Freziera guatemalensis** (Donnell-Smith), comb. nov.

Eurya guianensis (Wawra) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Frieziera guianensis** Wawra.

Eurya Hintoni Bullock in Kew Bull. Misc. Inform. **1936**: 391(1936). = **Symplococarpon Hintoni** (Bullock) Airy-Shaw in Hooker's Icon. Pl. **4**: t. 3342(1937).

Eurya inaequalifolia Lingelsheim in Fedde, Rep. Spec. Nov. **7**: 111(1909). = **Freziera inaequalifolia** (Lingelsheim), comb. nov.

Eurya inaequilatera (Britton) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera inaequilatera** Britton.

Eurya Karsteniana Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera Karsteniana** (Szyszylowicz), comb. nov.

Eurya lanata (Tulasne) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera lanata** Tulasne.

Eurya lancifolia Standley in Field Mus. Publ. Bot. **8**: 317(1931). = **Freziera lancifolia** (Standley), comb. nov.

Eurya lasiopetala (Wight) Gardner in Calcutta Jour. Nat. Hist. **7**: 446(1847) = **Adinandra lasiopetala** (Wight) Choisy.

Eurya Lehmannii Hieronymus in Bot. Jahrb. **20**, Beibl. 49: 49(1895). = **Freziera Lehmannii** (Hieronymus), comb. nov.

Eurya longipes (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera longipes** Tulasne.

Eurya macrophylla (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera macrophylla** Tulasne.

Eurya mexicana (Turczaninow) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 189(1893). = **Freziera mexicana** (Turczaninow), comb. nov.

Eurya monsonensis Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera monsonensis** (Melchior), comb. nov.

Eurya myrtilloides Elmer, Leafl. Philipp. Bot. **1**: 323(1908). = **Ilex crenata** Thunberg var. **luzonica** (Rolfe) Loesener.

Eurya Nimanimae (Tulasne) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147(1925). = **Freziera Nimanimae** Tulasne.

Eurya nitida Hieronymus in Bot. Jahrb. **20**, Beibl. 49: 50(1895), non Korthals. = **Freziera Hieronyma**, nom. nov.

Eurya reticulata (Humboldt & Bonpland) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera reticulata** Humboldt & Bonpland.

Eurya reticulata (Humboldt & Bonpland) Szyszylowicz var. *subintegrifolia* Hieronymus in Bot. Jahrb. **20**, Beibl. 49: 51(1895). = **Freziera reticulata** Humboldt & Bonpland var. **subintegrifolia** (Hieronymus), comb. nov.

Eurya roraimensis (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera roraimensis** Tulasne.

Eurya Seemanniana Pittier in Contrib. U. S. Nat. Herb. **20**: 480(1922). = **Freziera Seemanniana** (Pittier), comb. nov.

Eurya sericea (Humboldt & Bonpland) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera sericea** Humboldt & Bonpland.

Eurya serisea (Humboldt & Bonpland) Szyszylowicz var. *chrysophylla* (Humboldt & Bonpland) Hieronymus in Bot. Jahrb. **20**, Beibl. 49: 49(1895). = **Freziera sericea** Humboldt & Bonpland var. **chrysophylla** (Humboldt & Bonpland), comb. nov.

Eurya spathulifolia Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera spathulifolia** (Melchior), comb. nov.

Eurya suberosa (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera suberosa** Tulasne.

Eurya subintegrifolia (Rusby) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera subintegrifolia** (Rusby), comb. nov.

Eurya syphilitica (Choisy) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 189(1893). = **Ternstroemia ?** sp.

Eurya ternstroemioides O. C. Schmidt in Fedde, Rep. Spec. Nov. **24**: 79(1927). = **Freziera ternstroemioides** (O. C. Schmidt), comb. nov.

Eurya vaccinioides O. C. Schmidt in Fedde, Rep. Spec. Nov. **22**: 98(1925). = **Freziera vaccinioides** (O. C. Schmidt), comb. nov.

Eurya verrucosa Hieronymus in Bot. Jahrb. **20**, Beibl. 49: 51(1895). = **Freziera verrucosa** (Hieronymus), comb. nov.

Eurya Wawrai (Urban) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 149(1925). = **Freziera Wawrai** Urban.

Eurya Yungasiae (Tulasne) Szyszylowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190(1893). = **Freziera Yungasiae** Tulasne.

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Synonyms are printed in *italics;* new names in **bold-face** type.

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STUDIES IN THE LAURACEAE. I[1]

Chinese and Indo-Chinese Species of Litsea, Neolitsea, and Actinodaphne

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For many years there has been a great deal of confusion among taxonomists regarding the treatment of the genera of the Lauraceae. The line of demarcation between some of the genera is so artificial as to be useless in grouping the species together as natural units. The present treatment is no exception as far as this point is concerned. Its scope is merely to place the various species, in so far as is possible at this time, in the genera into which they fall according to the artificial key given below. Inasmuch as only Chinese and Indo-Chinese material is considered, the key will hold. The study of the Indian species, which I hope to make eventually, will in all probability necessitate many more transfers, or perhaps even a revision of our concepts of the genera involved. Because this study is limited geographically, the sections which have been described will not be taken up at present. These will be treated at a later date.

In order to prevent any misunderstanding of terms, there are a few definitions which I deem it advisable to present.

By "triplinerved," I mean that situation in which the midrib and the lowermost pair of nerves are three distinct entities, adnate 1–20 (or more) mm. above the base of the leaf.

The term "minutely reticulate" refers to that type of reticulation which approaches a subfoveolate condition.

In treating the Lauraceae the term "umbellate" has been very loosely applied to the inflorescence. There are no true umbels in this family. It should be understood that in the following pages, where the term "umbel" or "umbellate" is used, the actual condition is one approaching that. "Subumbel" and "subumbellate" rather should be used.

[1] Issued December 27, 1937.

An "induvium" such as is found in *Litsea baviensis (L. Maclurei)* and *L. Pierrei* is, according to B. D. Jackson's 'Glossary,' that portion of the corolla which persists in a withered condition at the base of the fruit. The interpretation of Gatin is the one used in the following pages, namely, an accrescent calyx or perianth which enlarges to almost completely enclose the fruit.

It is my great pleasure to dedicate this paper to Dr. J. M. Greenman, of the Missouri Botanical Garden, to whom I owe inspiration and encouragement as a student in Botany. For the co-operation in preparing it, I am indeed grateful to Dr. E. D. Merrill, Director, and Prof. Alfred Rehder, Curator, of the Arnold Arboretum. Thanks are due also to the curators of the herbaria of the following institutions for the generous loan of types and photographs of types: University of California, Gray Herbarium of Harvard University, Royal Botanical Gardens at Kew, Rijksherbarium at Leiden, New York Botanical Garden, Muséum National d'Histoire Naturelle at Paris, and Botanisches Institut der Universität at Vienna.

KEY TO THE GENERA

1. Fertile stamens 12; leaves usually penninerved.
   2. Bracts persistent until anthesis; fruits subtended by unchanged calyx tube, or one thickened or discoid; leaves usually non-verticillate..... ..... *Litsea*, p. 362
   2. Bracts caducous before anthesis; fruit subtended by cyathiform calyx tube appendaged by residue of lobes; leaves usually verticillate..... ..... *Actinodaphne*, p. 400
1. Fertile stamens 6; leaves 3-plinerved (usually) ..... *Neolitsea*, p. 415

KEY TO THE SPECIES OF LITSEA

1. Leaves membranaceous and usually deciduous.
   2. Leaves orbicular or broadly ovate; petioles 3–5 cm. long.
      3. Leaves auriculate at base..... 1. *L. auriculata*
      3. Leaves not auriculate at base..... 2. *L. populifolia*
   2. Leaves not orbicular or broadly ovate; petioles less than 2 cm. long.
      3. Flowers 4–6 per umbel.
         4. Lower leaf-surface very softly pubescent; bark with turpentine-like odor..... 3. *L. mollifolia*
         4. Lower leaf-surface glabrous to somewhat pubescent; bark aromatic, not with turpentine odor.

5. Fruit globose, apiculate.....4. *L. euosma*
5. Fruit spherical, with no pronounced apicule.....5. *L. Cubeba*
3. Flowers 7–12 (or more) per umbel.
4. Peduncles of inflorescence 1.5–3.5 cm. long.....6. *L. Forrestii*
4. Peduncles of inflorescence less than 1.5 cm. long.
5. Young leaves covered with long yellowish or reddish brown sericeous pubescence.
6. Leaves oblong-lanceolate, acuminate.....7. *L. sericea*
6. Leaves obovate-elliptic, acute or obtuse, pubescence conspicuously persisting along midrib at maturity.....8. *L. Veitchiana*
5. Young leaves not covered with long yellowish or reddish brown sericeous pubescence.
6. Branchlets very long and seemingly pendulous, with very short floriferous side shoots.....9. *L. moupinensis*
6. Branchlets not very long and not seemingly pendulous; numerous side branchlets up to 15 cm. long.
7. Flowers in anthesis before the appearance of leaves.
8. Leaves pubescent to glabrescent; fruit slightly more ellipsoid than globose.....10. *L. pungens*
8. Leaves glabrous; fruit globose.....11. *L. ichangensis*
7. Flowers in anthesis after the appearance of leaves.
8. Leaves obovate-oblong or elliptic-oblong.....12. *L. Chenii*
8. Leaves not obovate-oblong or elliptic-oblong.
9. Leaves less than 4.7 cm. long.....13. *L. Chunii*
9. Leaves always more than 4 cm. long.
10. Leaves 4–6 cm. long.....14. *L. rubescens*
10. Leaves longer than 4–6 cm.
11. Leaves somewhat rounded; pedicels 7–8 mm. long .....14a. *L. rubescens* var. *yunnanensis*
11. Leaves 12–13 cm.; pedicels 9–10 mm. long..... .....14b. *L. rubescens* f. *tonkinensis*

1. Leaves not membranaceous and not deciduous as far as is known.
2. Leaves verticillate.
3. Leaves acutish or obtuse at base.
4. Leaves closely pubescent, margin never appearing ciliate; ultimate venation fine but not reticulate; umbels 5 mm. in diam..... .....15. *L. verticillata*
4. Leaves loosely covered with long rather silky pubescence, margin appearing ciliate; ultimate venation very loose; umbels 8 mm. in diam. .....15a. *L. verticillata* var. *annamensis*
3. Leaves rounded or subauriculate at base.
4. Fruit subsessile or very short-pedunculate..... .....15b. *L. verticillata* var. *brevipes*
4. Fruit decidedly long-pedunculate...15c. *L. verticillata* var. *brevipetiolata*
2. Leaves not verticillate.
3. Leaves heavily coriaceous; mostly over 12 cm. long.
4. Inflorescence subumbellate.
5. Leaves obovate.....16. *L. honghoensis*

5. Leaves not obovate.
6. Leaves over 25 cm. long.....17. *L. grandifolia*
6. Leaves not over 22 cm.
7. Inflorescence subsessile or very short-pedunculate.
8. Leaves finely and pale-tomentose on lower surface, ferrugineous-tomentose on veins; fruit subtended by pubescent cupule not over 0.5 cm. deep...18. *L. Griffithii* var. *annamensis*
8. Leaves glabrous or subglabrous on lower surface.
9. Fruit subtended by shallow cupule 3–5 mm. deep, and 7 cm. broad, cupule sessile.....19. *L. Clemensii*
9. Fruit subtended by large verrucose cupule 2 cm. deep and 2 cm. broad, cupule pedunculate.....20. *L. baviensis*
7. Inflorescence definitely pedunculate.
8. Leaves lanceolate or lanceolate-elliptic.
9. Leaves subtriplinerved..21a. *L. chartacea* var. *subtriplinervis*
9. Leaves penninerved.
10. Secondary veins 6–8 pairs at most, very dark against the glaucous lower surface of the leaf; leaves lanceolate-elliptic.....21. *L. chartacea*
10. Secondary veins more than 10 pairs.....22. *L. lancilimba*
8. Leaves elliptic or oblong-elliptic.
9. Largest leaves not under 15 cm.....23. *L. longipes*
9. Largest leaves not over 13 cm.
10. Lateral veins prominent below, nearly as prominent as midribs.....24. *L. Helferi* var. *laosensis*
10. Lateral veins obsolete or subobsolete; midrib very prominent.....25. *L. eugenioides*
4. Inflorescence not subumbellate.
5. Largest leaves not less than 16 cm. long.
6. Largest leaves 23–25 cm. long.....29a. *L. Pierrei* var. *grandifolia*
6. Largest leaves 16–20 cm. long.
7. Perianth 8-parted.....26. *L. Liyuyingi*
7. Perianth 6-parted.
8. Inflorescence subtended by pedicels 4–5 mm. long, leaves oblanceolate.....20a. *L. baviensis* var. *szemaois*
8. Inflorescence subtended by pedicels 2 mm. long, leaves elliptic.....27. *L. Panamonja*
5. Largest leaves not more than 15 cm. long.
6. Fruit globose .....28. *L. Rehderiana*
6. Fruit not globose.
7. Inflorescence subtended by pedicels about 2 mm. long; fruit ellipsoid, 25 × 10–11 mm.; cupule never lobed.....29. *L. Pierrei*
7a. Fruit ellipsoid-ovoid, 22 × 11–12 mm.; cupule often lobed .....29b. *L. Pierrei* var. *lobata*
7. Inflorescence subtended by pedicels 5–12 mm. long; leaves up to 15 cm. long.....30. *L. cambodiana*
7a. Common peduncle 4 cm. long; leaves up to 10 cm. long.... .....30b. *L. cambodiana* var. *multiracemosa*

7b. Common peduncle 10 cm. long; leaves variable.....
.....30a. *L. cambodiana* var. *longiracemosa*

3. Leaves subcoriaceous; mostly less than 12 cm. long.
4. Leaves linear to linear lanceolate.
5. Inflorescence sessile.....31. *L. Thorelii*
5. Inflorescence definitely pedunculate.....32. *L. pseudoelongata*
4. Leaves not linear to linear-lanceolate.
5. Perianth incomplete or aborted; leaves, pedicels and branchlets heavily pubescent.....33. *L. glutinosa*
5a. Leaves smaller, and always obtuse.....
.....33a. *L. glutinosa* var. *brideliifolia*
5. Perianth complete, 6 segments.
6. Leaves rotund to ovate to obovate or obovate-elliptic.
7. Leaves rotund, less than 4 cm. long.....34. *L. rotundifolia*
7. Leaves not rotund, more than 4 cm. long.
8. Leaves obtuse or rounded at apex, occasionally short-acuminate or apiculate.
9. Leaves shining above, oval-oblong; petioles 1–1.5 cm. long
.....35. *L. firma* var. *austrannamensis*
9. Leaves dull above, obovate or obovate-oblong; petioles 1–2.4 cm. long.....36. *L. monopetala*
8. Leaves acuminate at apex, acute at base.
9. Largest leaves under 11 cm. long.....37. *L. Wilsonii*
9. Largest leaves over 11 or usually 15 cm. long.
10. Stamens not exserted; leaves very attenuately acuminate, tending towards caudate, slightly falcate....
.....38. *L. Garrettii*
10. Stamens greatly exserted.....
.....38a. *L. Garrettii* var. *longistaminata*
6. Leaves not rotund to ovate to obovate or obovate-elliptic.
7. Inflorescences crowded at the tips of branches.
8. Lateral veins ascending, mostly prominent (except in *L. Kobuskiana*).
9. Umbels subsessile or short-pedunculate; peduncles 2–3 mm. long.
10. Bracts on outer surface canescent-sericeous at apex, shading to brown-pubescent at base.
11. Lateral veins very prominent; leaves obovate, pubescent below.....39. *L. acutivena*
11. Lateral veins obscure; leaves oblong-elliptic or lanceolate, glabrescent to glabrous.....40. *L. Kobuskiana*
10. Bracts pale brownish-pubescent.....41. *L. Faberi*
9. Umbels pedunculate; peduncles 4–5 cm. long.
10. Leaves pubescent on lower surface.....42. *L. elongata*
10. Leaves glabrous or extremely glabrescent on lower surface.....42a. *L. elongata* var. *cuneifolia*
8. Lateral veins not ascending, but nearly horizontal, very obscure; leaves glaucous on lower surface.....43. *L. hupehana*

7. Inflorescences not crowded at the tips of branches.
8. Leaves 15 cm. or more long.
9. Stamens very greatly exserted; leaves greyish-brown, pubescent on lower surface.....44. *L. Dunniana*
9. Stamens not exserted.
10. Leaves and branchlets ferrugineous-pubescent.....45. *L. mekongensis*
10. Leaves and branchlets glabrous to glabrescent.....46a. *L. viridis* var. *Clemensii*
8. Leaves less than 12 cm. long.
9. Inner pairs of bracts cano-sericeous; outer brown-pubescent; leaves very pale green.....46. *L. viridis*
9. Inner pairs of bracts not differentiated from outer.
10. Leaves oblong-linear, narrowly or oblong-lanceolate; secondary venation obscure above; inflorescence short-racemose.....47. *L. iteodaphne*
10a. Leaves subacuminate; venation inconspicuous.....47a. *L. iteodaphne* f. *chinensis*
10. Leaves not oblong-linear or oblong-lanceolate.
11. Leaves oblanceolate, obtuse.
12. Leaves usually less than 7 cm. long, glaucous and obscurely reticulate below.....34a. *L. rotundifolia* var. *oblongifolia*
12. Leaves more than 7 cm. long, variable in shape, not glaucous, but conspicuously reticulate below.....48. *L. variabilis*
11. Leaves lanceolate or elliptic.
12. Leaves somewhat membranaceous, glaucous.....48a. *L. variabilis* var. *oblonga*
12. Leaves more coarse, less membranaceous.
13. Leaves glabrous below.....49. *L. Greenmaniana*
13. Leaves pubescent below.
14. Veins 6 or less pairs.
15. Leaves greyish-glaucous or lightly pubescent below; brownish-pubescent on veins.....50. *L. lancifolia*
15a. Umbels pedunculate; peduncles 5–6 mm. long.....50a. *L. lancifolia* var. *pedicellata*
15. Leaves not glaucous-pubescent below; pubescent on nerves at first, finally glabrous.....51. *L. Balansae*
14. Veins more than 6 pairs; leaves and branchlets brown-tomentose below....52. *L. umbellata*

1. **Litsea auriculata** Chien & Cheng, Contr. Biol. Lab. Sci. Soc. China, **6**: 59, fig. 1. 1931.

Distribution: known only from type locality.

CHINA. CHEKIANG: *S. S. Chien 601; W. C. Cheng 2348, 2349* (syntypes, Herb. Biol. Lab. Sci. Soc.; isotypes, AA); *S. Chen 518; W. C. Cheng 2152.*

A large-leaved *Litsea* with the auriculate-obovate leaves 17 × 13 cm. approximately, presenting an unmistakable diagnostic character. The most nearly related species is *Litsea cordata* Jack, from India, which is readily distinguished by its long-racemose inflorescence. *Litsea auriculata* Chien & Cheng resembles also *Actinodaphne confertiflora* Meissn. from India and from western China, which does not have auriculate leaf-bases and is minutely reticulate on both leaf-surfaces.

2. **Litsea populifolia** (Hemsl.) Gamble in Sargent, Pl. Wilson. 2: 77. 1914; Liou, Laurac. Chine Indoch. 172. 1932.

Lindera obovata Franch. Nouv. Arch. Mus. Hist. Nat. Paris, sér. II. 10: 76. 1887; Pl. David. 2: 114. 1888.

Lindera populifolia Hemsl. Jour. Linn. Soc. Bot. 26: 390. 1891.

Litsea longipetiolata Lecomte, Bull. Soc. Bot. France, 60: 85. 1913; Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 88. 1913; Liou, Laurac. Chine Indoch. 172. 1932, **syn. nov.**

Benzoin obovatum (Franch.) Rehd. Jour. Arnold Arb. 1: 145. 1919; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[5]: 42. 1925.

DISTRIBUTION: Tibet and western China.

TIBET. MOUPIN: *A. David* (type of *Lindera obovata* and syntype of *Litsea longipetiolata* not seen, Paris).

CHINA. YUNNAN: *J. M. Delavay 188, 5163* (syntypes of *Litsea longipetiolata*, Paris); *F. Ducloux 2110* (syntype of *L. longipetiolata*, Paris); *H. T. Tsai 51120, 52272.*—SZECHUAN: *E. Faber 55* (type of *Lindera populifolia*, Kew; isotype, NY); *F. T. Wang 22758; T. T. Yü 509, 534; W. P. Fang 2153, 2399.*

This species is characterized by large, up to 10 cm., orbicular or obovate leaves which have very long, up to 6 cm., slender petioles. Lecomte, in making the new combination under *Litsea*, proposed a new name since Nees had already published a *Litsea obovata* in reference to an entirely different plant. The differences between the types of *Litsea longipetiolata* and *L. populifolia* represent a degree of variation among individuals of the same species. There seems to be no valid character which separates the two.

3. **Litsea mollifolia** Chun, Sunyatsenia 1: 236. 1934.

Litsea mollis Hemsl. Jour. Linn. Soc. Bot. 26: 383. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[5]: 60. 1925; Liou, Laurac. Chine Indoch. 186. 1932; non *Litsea mollis* (Bl.) Boerl. in Handl. Fl. Ned. Ind. 3: 141. 1900.

DISTRIBUTION: western and central China.

CHINA. HUPEH: *A. Henry 3177, 4434, 5035* (syntypes, Kew; isotypes, AA), *1026* (syntype not seen, Kew); *C. S. Fan & Y. Y. Li 187.*—KWEICHOW: *A. N. Steward, C. Y. Chiao & H. C. Cheo 349.*

The species is difficult to separate from *L. Cubeba* Pers. and *L. euosma* W. W. Sm. For complete discussion see the latter species.

4. **Litsea euosma** W. W. Sm. Notes Bot. Gard. Edinb. **13**: 166. 1921; Liou, Laurac. Chine Indoch. 187. 1932.

DISTRIBUTION: French Indo-China, Burma and western China.

CHINA. YUNNAN: *G. Forrest 9333, 7858, 15951* (syntypes, Edinburgh; isotypes, AA); *G. Forrest 12101, 17947* (syntypes not seen, Edinburgh); *J. F. Rock 7361, 7736; H. T. Tsai 54981, 56672, 56782.*

FRENCH INDO-CHINA. TONKIN: *E. Poilane 19135.*

A species very difficult to separate from *Litsea mollifolia* Chun and *L. Cubeba* Pers. The fruit of *Litsea euosma* W. W. Sm. is definitely globose apiculate, and the bark (according to the original description, and some of the dried specimens still retain it) has a lemon-like fragrance. The fruit of *L. Cubeba* is spherical, with no pronounced apicule, and the bark is reported to be aromatic, hence the name *L. citrata* Bl. applied to the specimen from Java. The type specimens of *L. mollifolia* have a turpentine-like odor; the fruit is subglobose with no apparent apicule; the leaves seem to be less attenuately acuminate at the apex than those of *L. euosma*. *Litsea Cubeba* is glabrous to glabrescent; *L. euosma* is somewhat pubescent; and *L. mollifolia* extremely softly pubescent. As for distribution, *Litsea Cubeba* is widespread in southern Asia and the adjacent islands. *Litsea euosma* is prevalent in western China, Siam, and Burma. *Litsea mollifolia* is found in central and western China, and possibly in the east-central provinces.

5. **Litsea Cubeba** (Lour.) Pers. Syn. **2**: 4. 1807; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 57. 1925; Rehd. Jour. Arnold. Arb. **11**: 157. 1930; Liou, Laurac. Chine Indoch. 184. 1932; Merr. Trans. Am. Philos. Soc. n. ser. **24**: 166 (Comm. Loureiro Fl. Cochinch.). 1935.

Laurus Cubeba Lour. Fl. Cochinch. **1**: 252. 1790; ed. 2, 310. 1793.

Litsea citrata Bl. Bijdr. 565. 1825; Hemsl. Jour. Linn. Soc. Bot. **26**: 379. 1891.

Litsea mollis Hemsl. var. *glabrata* Diels, Engler's Bot. Jahrb. **29**: 349. 1900. *Litsea mollifolia* Chun var. *glabrata* (Diels) Chun, Sunyatsenia, **1**: 237. 1934, syn. nov.

For complete synonomy see Rehder, l.c.

DISTRIBUTION: India to China and Malaysia.

FRENCH INDO-CHINA. TONKIN: *J. Loureiro* (type not seen, Brit. Mus.); *A. Petelot 5569.*

CHINA. SZECHUAN: *F. T. Wang 22493, 23341; W. P. Fang 1069, 1199, 2186, 2213, 3065.*—YUNNAN: *A. Henry 11326, 11395, 12838; H. T. Tsai 50894, 51202, 51329, 51438, 51530, 51668, 51807, 54264, 55122, 55201, 55377, 58872, 59035, 59643, 59741, 60013, 60593, 62118.*—KWANGSI: *W. T. Tsang 22903, 21183, 21535, 21768; A. N. Steward & H. C. Cheo 2, 847, 727, 535.*—FUKIEN: *J. L. Gressitt 1716.*—KIANGSI: *S. K. Lau 4461, 3992.*—HAINAN: *F. C. How 70830, 71773; W. T. Tsang 187, 338; N. K. Chun & C. L. Tso 43730; C. Wang 33336, 34881, 35380; H. Y. Liang 63461, 64180, 64315, 64717, 66059.*

Many specimens more were seen but only a few of the numbers are cited above.

An extremely variable well-known species which is widespread, occurring throughout southern Asia and as far south as Java. It is often confused with *Litsea euosma* W. W. Sm. and *L. mollifolia* Chun. A detailed discussion is given under *L. euosma* W. W. Sm.

6. **Litsea Forrestii** Diels, Notes Bot. Gard. Edinb. **5**: 244. 1912; Liou, Laurac. Chine Indoch. 163. 1932.

DISTRIBUTION: western China.

CHINA. YUNNAN: *G. Forrest 374* (type not seen, Edinburgh).

Litsea Forrestii was described from immature specimens. Diels states that the species is easily recognized by the long peduncles of the inflorescence. The following numbers with these characteristically long peduncles are cited as possibly belonging to this species: from Yunnan, *J. F. Rock 8036, 8126; C. Schneider 4022;* from Kweichow, *J. Esquirol 738*[1]; from Kwangsi, *A. N. Steward & H. C. Cheo 12.*

7. **Litsea sericea** (Nees) Hook. f. Fl. Brit. Ind. **5**: 156. 1886; Chun, Contr. Biol. Sci. Soc. China, **1**[5]: 60. 1925; Liou, Laurac. Chine Indoch. 186. 1932.

Tetranthera sericea Nees in Wall. Pl. As. Rar. **2**: 67. 1831.

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[1] Litsea spec. Allen, Jour. Arnold Arb. **17**: 330. 1936.

Lindera Esquirolii Lévl. Fedde, Rep. Spec. Nov. **9**: 327. 1911; Fl. Kouy-Tchéou, 219. 1914, as synonym of *Lindera praecox* Bl.

DISTRIBUTION: India and western China.
INDIA. NEPAL: *N. Wallich 2545A*[1] (isotype, Kew, NY).
CHINA. SZECHUAN: *T. T. Yü 489.*

A species often confused with *Lindera umbellata* Thunb. in the fruiting stage, but distinguished by the glabrous or nearly glabrous winter buds; the more chartaceous leaves finely but distinctly reticulate below, less so above; and by the smaller fruits only 4–5 mm. long, borne on very slender pedicels.

8. **Litsea Veitchiana** Gamble in Sargent, Pl. Wilson. 2: 76. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[5]: 59. 1925; Liou, Laurac. Chine Indoch. 182. 1932.

DISTRIBUTION: western China.
CHINA. SZECHUAN: *Veitch Exped. 4426; E. H. Wilson 3672* (syntypes, AA).

It is my opinion that the two specimens cited above are not conspecific. The color of the pubescence is different. *No. 4426* has long ferrugineous pubescence; *no. 3672* has light tawny pubescence. The veins of *no. 3672* are straight, evenly pinnate, those of *no. 4426* are crooked and irregularly pinnate. The leaf shape in general of *no. 3672* is the more lanceolate of the two. Liou has seen a ♂ specimen that is a satisfactory match *(Chen no. 5839)* for the species. He does not mention leaf characters in his description, so it is not clear which of the syntypes the latter matches. Until more abundant material comes in from Yunnan, I will merely call attention to the apparent dissimilarity between the two specimens cited as types.

9. **Litsea moupinensis** Lecomte, Bull. Soc. Bot. France, 60: 84. 1913; Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 88. 1913; Liou, Laurac. Chine Indoch. 187. 1932.

Lindera puberula Franch. Pl. David. 2: 115. 1887; Nouv. Arch. Mus. Hist. Nat. Paris. sér. II. 10: 77. 1887.
Benzoin puberulum (Franch.) Rehd. Jour. Arnold Arb. 1: 145. 1919; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[5]: 41. 1925.

DISTRIBUTION: Tibet and western China.
TIBET. MOUPIN: *A. David* in 1869 (type, Paris).
CHINA. YUNNAN: *F. Ducloux 4508; P. Farges 617* (syntypes not seen, Paris).

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[1] I have not seen any of the Wallich specimens which are the types of Nees' species treated in the present paper. However, I have borrowed the isotypes from Kew. At the death of Nees, the latter's herbarium was divided and sold. The Laurineae became a part of the Zschok herbarium which at that time was somewhere in Austria.

Franchet states that *Lindera puberula* Franch. is similar to *Lindera Griffithii* Meissn. and *Lindera sericea* Bl., differing, however, in the adult branches being covered with a very fine close pubescence. This is another case where it is practically impossible to match the ♂ and ♀ specimens. It is my belief that some of the fruiting specimens of *Lindera umbellata* Thunb., reported from Yunnan and Szechuan, are not linderas but belong to *Litsea moupinensis* Lecomte. I have seen in no collection from the western provinces of China a ♂ specimen of *Lindera umbellata*. Plenty have been collected from Japan and from eastern and even northern China. This discrepancy must eventually be accounted for, and it may be that the above suggestion will be the solution. When Lecomte recognized the above plant as a *Litsea*, he had to adopt a new name because of the earlier *Litsea puberula* Miq.

10. **Litsea pungens** Hemsl. Jour. Linn. Soc. Bot. **26**: 384. 1891; Gamble in Sargent, Pl. Wilson. **2**: 76. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 59. 1925; Liou, Laurac. Chine Indoch. 186. 1932.

DISTRIBUTION: western and central China.

CHINA. HUPEH: *A. Henry 230, 1302* (syntypes not seen, Kew), *3617, 3617B, 6294* (syntypes, Kew; isotypes, Gray); *H. C. Chow 372, 583*.—SZECHUAN: *A. Henry 5579* (syntype not seen, Kew).—KWEICHOW: *A. N. Steward, C. Y. Chiao & H. C. Cheo 35*.

A species distinctive because of the fine texture of the elliptic leaves and the very small (3 mm. diam.) globose fruit, subtended by a calyx scarcely enlarged.

11. **Litsea ichangensis** Gamble in Sargent, Pl. Wilson. **2**: 77. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 58. 1925; Liou, Laurac. Chine Indoch. 180. 1932.

DISTRIBUTION: known only from type locality.

CHINA. HUPEH: *E. H. Wilson 297; Veitch Exped. 34* (syntypes not seen, Kew); *E. H. Wilson 298* (syntype, Kew; isotype AA).

The species resembles the Genus *Cinnamomum* in the frequent occurrence of glands in the axils of the veins on the under surfaces of the leaves, and in the spicy lemon-like odor of the bark and leaves. The latter are ovate, obtuse and very small, usually under 4 cm. long.

12. **Litsea Chenii** Liou, Laurac. Chine Indoch. 183. 1932.

DISTRIBUTION: known only from type locality.
CHINA. SZECHUAN: *S. Chen 7091* (type not seen, Paris).

Liou states that this species is similar to *Litsea rubescens* Lecomte but differs in the disposition of the anthers of the third cycle of stamens, the pubescent filaments, the larger leaves which are pubescent below, and the more numerous secondary nerves. He states also that it is near *Litsea mollifolia* Chun, but has solitary, larger umbels, larger leaves, etc.

13. **Litsea Chunii** Cheng, Contr. Biol. Lab. Sci. Soc. China, 9: 196, fig. 19. 1934.

DISTRIBUTION: known only from type localities.
CHINA. SZECHUAN: *W. C. Cheng 672* (syntype not seen, Fan Mem. Inst. Biol. †). —SIKIANG: *W. C. Cheng 1173* (syntype not seen, Fan Mem. Inst. Biol. †); *W. C. Cheng 924, 926* (paratype, Fan Mem. Inst. Biol.).

Chen places this species near *Litsea pungens* Hemsl., from which it differs in the usually smaller elliptic-lanceolate leaves almost glabrous beneath, even when young; in the oblong or ovate-oblong perianth lobes and glabrous stamens; and in the ovoid fruit. I have seen no representative of this species.

14. **Litsea rubescens** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 86. 1913; Liou, Laurac. Chine Indoch. 183. 1932.

DISTRIBUTION: western China.
CHINA. KIENT CHANG: *A. F. Legendre 1385* (type not seen, Paris).

14a. **Litsea rubescens** Lecomte var. **yunnanensis** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 86. 1913; Liou, Laurac. Chine Indoch. 183. 1932.

DISTRIBUTION: western China.
CHINA. YUNNAN: *J. M. Delavay 4020* (type, Paris).—SZECHUAN: *W. P. Fang 808.*—KWEICHOW: *W. Y. Chun 7333.*

Both the species and the variety are characterized by the buds being extremely apiculate before anthesis. The variety has round leaves that are longer than those of the species. The leaves of the species are 4–6 cm. long, 1.7–2.2 cm. broad.

14b. **Litsea rubescens** Lecomte f. **tonkinensis** Liou, Laurac. Chine Indoch. 183. 1932.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. TONKIN: *E. Poilane 12625* (type not seen, Paris).

This differs from var. *yunnanensis* in having longer leaves and longer fruiting pedicels.

15. **Litsea verticillata** Hance, Jour. Bot. **21**: 356. 1883; Hemsl. Jour. Linn. Soc. Bot. **26**: 386. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 65. 1925; Liou, Laurac. Chine Indoch. 171. 1932; Merr. Lingnan Sci. Jour. **16**: 190. 1937.

Litsea multiumbellata Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 85. 1913; Fl. Gén. Indoch. **5**: 133. 1914; Liou, Laurac. Chine Indoch. 171. 1932.

Litsea brevipetiolata Lecomte, Fl. Gén. Indoch. **5**: 132. 1914, pp.

DISTRIBUTION: French Indo-China to China.

CHINA. KWANGTUNG: *B. C. Henry, Herb. Hance 22051* (type of *Litsea verticillata*, Brit. Mus.); *C. O. Levine 359*.—HAINAN: *S. K. Lau 1502, 2581, 3828; H. Fung 20407; H. Y. Liang 62626, 62149, 63520*. Numerous other collections have been examined.

FRENCH INDO-CHINA. TONKIN: *D. Bois 230* (syntype of *Litsea brevipetiolata*, Paris).—CAMBODIA: *L. Pierre 643* (type of *Litsea multiumbellata*, Paris; isotype, AA).

This species is extremely variable in leaf structure and in inflorescence. Typical *Litsea verticillata* has branchlets densely ferrugineous-hirsute, finally glabrous; leaves verticillate, penninerved, subsessile, lanceolate or lanceolate-oblong, base obtuse, apex gradually acuminate, hirtellous to glabrous above, venation ferrugineous-hirtellous below, bracts of inflorescence cano-sericeous on the outside. These characters are all variable: the degree which the leaves are sessile, the leaf base, the leaf shape, venation and pubescence, and the length of the pedicels of the inflorescence. There is an intergradation of all of these, also, to be found on an examination of numerous herbarium specimens. The following varieties which have been retained represent the extremes of variation within the species.

15a. **Litsea verticillata** f. **annamensis** (Liou), comb. nov.

Litsea multiumbellata Lecomte f. *annamensis* Liou, Laurac. Chine Indoch. 171. 1932.

DISTRIBUTION: French Indo-China and China.
FRENCH INDO-CHINA. ANNAM: *E. Poilane 7547* (type, Paris; photo., AA).
CHINA. YUNNAN: *H. T. Tsai 61180, 61379, 61501, 61613.*

It is with some hesitation that I have included the Yunnan specimens under this variety, since I have only the photograph of the type for comparison. The leaves of the former seem to be on the whole rather more acuminate, and the umbels somewhat shorter in several cases. The venation and pubescence, as far as can be judged, agree with the variety. Liou gives as a diagnostic character the size of the umbels as 8 mm. before anthesis. This increase in size seems to be prevalent in the *verticillata* group, and does not therefore have a great deal of value as a varietal character. The number of flowers, which he gives as five, is variable also. Likewise, leaf-length varies. The very loose reticulation is a distinctive character.

15b. **Litsea verticillata** var. **brevipes** Merr. & Metc. in Lingnan Sci. Jour. **16**: 81. 1937.

DISTRIBUTION: China.
CHINA. KWANGTUNG: *W. T. Tsang 16602* (type, Lingnan U.; isotype, NY).

This is very similar to var. *brevipetiolata* (Lecomte) Allen in that the leaf bases are the same. The inflorescence, however, is sessile.

15c. **Litsea verticillata** Hance var. **brevipetiolata** (Lecomte), comb. nov.

Litsea brevipetiolata Lecomte, Fl. Gén. Indoch. **5**: 132. 1914, pp.; Liou, Laurac. Chine Indoch. 172. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. TONKIN: *H. Bon 3311* (syntype, Paris); *Mouret, B. Balansa* (syntypes not seen, Paris); *W. T. Tsang 23038?* (differs from the type in having a less dense pubescence).

I have seen only two of the four types on which Lecomte based his description of *L. brevipetiolata. Bon No. 3311,* I take to be typical. *Bois No. 230,* also from Tonkin, is a typical *Litsea verticillata* described from Kwangtung. The petioles vary in length, and the leaves are acute at the base, with the typical under-surface, venation and pubescence typical of the latter species. In *Litsea brevipetiolata* the leaves are rounded at the

base, abruptly contracted or subauriculate, and in *L. verticillata*, obtuse or sometimes subrotund.

16. **Litsea honghoensis** Liou, Bull. Soc. Bot. France, **80**: 567. 1933.

Litsea wenshanensis Hu, Bull. Fan Mem. Inst. Biol. **5**: 308. 1934; Hu in Hu & Chun, Ic. Pl. Sin. **4**: 10, pl. 160. 1935, **syn. nov.**

DISTRIBUTION: China (Yunnan).

CHINA. YUNNAN: *H. T. Tsai 51726* (type of *Litsea wenshanensis*, Fan Mem. Inst. Biol.; isotype, AA), *51502, 51555* (paratypes of *Litsea wenshanensis*, Fan Mem. Inst. Biol.; isotypes, AA); *A. Henry 10856A* (type of *L. honghoensis* Liou, NY; isotype, AA).

This Yunnan species is distinguished by its large (10–13 cm. long × 4–6 cm. broad), coriaceous, oblong-elliptic to obovate leaves, yellow-green above, glaucous below, the veins red to yellow. The inflorescence consists of numerous fascicled or solitary umbels.

Liou, in 1933, has tentatively described *Litsea ? honghoensis*. He has only ♀ flowers. He gives no collector. The title indicates that the species is from Yunnan. By chance, I found the type specimen so labeled in the N. Y. Herb. There is no difference apparent between the two species *L. honghoensis* and *L. wenshanensis*, the latter automatically falling into synonymy under the former.

17. **Litsea grandifolia** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 87. 1913; Fl. Gén. Indoch. **5**: 141. 1914; Liou, Laurac. Chine Indoch. 175. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. COCHINCHINA: *L. Pierre 5149* (type, Paris).

This seems to be near *Litsea baviensis* Lecomte, or its variety *szemaoïs* (Liou) Allen, but the leaves are much larger, and the fruit is borne in clusters on a longer peduncle.

18. **Litsea Griffithii** Gamble var. **annamensis** Liou, Laurac. Chine Indoch. 193. 1932.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. ANNAM: *E. Poilane 10524, 16581* (syntypes, Paris); *J. & M. S. Clemens 4242*.—TONKIN: *E. Poilane 13132* (syntype, Paris).

Both the species and the variety are very striking plants with large coriaceous elliptic leaves 10–15 cm. in length, 5–8 cm. broad, greenish yellow above, very pale below, lightly covered with reddish pubescence, the veins ascending-arcuate and densely ferrugineous-tomentose. The branchlets and petioles also are densely appressed-tomentose. The differences between the species and the variety as given by Liou seem to be differences in degree of variation. Without examining all of the specimens cited both for the species and the variety, the true status of the variety in relation to the species cannot be ascertained.

19. **Litsea Clemensii**, spec. nov.

Arbor parva, ramulis teretibus rubescentibus striatulis ex pubescentibus glabrescentibus. Folia opposita, satis coriacea, oblongo-elliptica, 12–20 cm. longa, 4–5.5 cm. lata, acuta vel acuminata, supra inconspicue subtus prominenter reticulata, ex glabrescentibus glabra, margine laxe undulata, penninervia, nervis 8–10 arcuatis, supra inconspicuis subtus elevatis, petiolis 8–22 mm. longis, glabrescentibus. Inflorescentia subumbellata, solitaria, pauciflora, axillaris vel subterminalis, breviter pedunculata. Flores ♂ et ♀ ignoti. Fructus late ellipsoideus, 10 mm. longus, 8 mm. latus, cupula 3–4 mm. longa, 6–8 mm. lata, pateriformi, matura utrinque glabra sessili.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. ANNAM: *J. & M. S. Clemens 3268* (type, AA).

The sessile subumbels, of which only 1 or 2 flowers develop into mature fruit, present an unusual appearance. For the most part, two mature fruits are seen side by side at maturity.

This species is named for the late Chaplain and Mrs. Clemens who have contributed largely to our Indochinese collections.

20. **Litsea baviensis** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 87. 1913; Fl. Gén. Indoch. 5: 142. 1914; Liou, Laurac. Chine Indoch. 176. 1932.

Litsea Macluret Merr. Philip. Jour. Sci. 23: 244. 1923; Liou, Laurac. Chine Indoch. 178. 1932, syn. nov.

DISTRIBUTION: China and French Indo-China.

FRENCH INDO-CHINA. TONKIN: Mont Bavi, *B. Balansa 2401* (type of *L. baviensis*, Paris; photo. and fragm., AA).—ANNAM: *E. Poilane 22073, 23750.*

CHINA. HAINAN: *F. A. Maclure 9586* (type of *L. Maclurei*, Herb. Manila; isotype, AA); *H. Fenzel 90; W. T. Tsang & H. Fung 575, 619; W. T. Tsang 692; S. K. Lau 1620, 2927, 3600, 3861; F. C. How 70389, 72160; H. Y. Liang 62439, 64288, 64910; C. Wang 33535, 33541, 34315, 35289.*

The above-mentioned species is characterized by coriaceous, oblong or lanceolate leaves up to 20 cm. long, yellow-green above and glaucous below. The black glabrous fruit is enclosed in a large fleshy, greyish truncate verrucose cupule or induvium which is glabrous. Liou suggests the similarity of the two species but keeps them distinct because of more visible veins on the lower surface of *L. baviensis* Lecomte, and its longer peduncles. I have the types of both before me, and the differences do not seem important enough to warrant retaining them as separate species.

20a. **Litsea baviensis** Lecomte var. **szemaoïs** (Liou), comb. nov.

Litsea Pierrei Lecomte var. *szemaoïs* Liou, Laurac. Chine Indoch. 174. 1932.

DISTRIBUTION: known only from type locality.

CHINA. YUNNAN: Szemao, *A. Henry 12025* (type of *L. Pierrei szemaoïs*, NY; isotype, AA).

Liou mentions the similarity of the variety to *Litsea Maclurei* Merr. (now *L. baviensis* Lecomte), which seems to be a nearer relation than *L. Pierrei* Lecomte. The leaf characters certainly do not resemble those of the latter. The inflorescence of *L. baviensis* Lecomte is fasciculate while in the variety *szemaoïs* Liou, it is of a racemose type. The latter, however, is quite distinct from that of *L. Pierrei* Lecomte, the raceme of which breaks up into numerous individual flowers. In the variety, the ultimate branchlets consist of several-flowered umbels. Of the two types of inflorescence, the latter has a closer affinity to the fascicle than the racemose type of *L. Pierrei* Lecomte. For these reasons, the variety has been transferred to *L. baviensis* Lecomte.

21. **Litsea chartacea** (Nees) Hook. f. Fl. Brit. Ind. 5: 170. 1886.

Tetranthera chartacea Wall. ex Nees in Wall. Pl. As. Rar. 2: 67. 1831; 3: 30. 1832.

Litsea Eberhardtii Liou, Laurac. Chine Indoch. 181. 1932, syn. nov.

Litsea baviensis Lecomte var. *venulosa* Liou, Laurac. Chine Indoch. 177. 1932, syn. nov.

DISTRIBUTION: India through French Indo-China to western China.

INDIA. NEPAL: *N. Wallich 2531* (isotype of *Tetranthera chartacea*, Kew, see footnote, p. 370).—E. HIMALAYA: *W. Griffith 4292.*

FRENCH INDO-CHINA. TONKIN: *P. Eberhardt 4950* (type of *Litsea Eberhardtii*, Paris; photo., AA); *E. Poilane 13117.*—ANNAN: *E. Poilane 10697* (type of *Litsea baviensis* var. *venulosa*, Paris; photo., AA).

CHINA. YUNNAN: Szemao, *A. Henry 12013.*

Although the photograph alone of *Litsea Eberhardtii* Liou is at hand there seems no doubt that this plant is conspecific with *Litsea chartacea* from Nepal. The type of *Litsea baviensis* Lecomte var. *venulosa* Liou agrees perfectly with the latter. The question of reticulation, which does not show in detail in the photograph, is not mentioned in the description of *L. Eberhardtii*, but the type of *L. Eberhardtii* var. *subtriplinervis* Liou shows a reticulation similar to that of *L. chartacea* (Nees) Hook. f. It seems a reasonable assumption that a like situation obtains in the species proper. *Poilane 13117*, from Tonkin, cited by Liou under *Litsea baviensis* Lecomte, is a fruiting specimen showing no similarity to the fruit of the latter. The leaves in every respect correspond to those of *L. chartacea.* Both the type of *L. Eberhardtii* Liou, and Poilane's fruiting specimen were collected in the vicinity of Hanoi, Tonkin; the former in the province of Vinh-yen, to the north, the latter near Chobo, to the southwest.

21a. **Litsea chartacea** (Nees) Hook. f. var. **subtriplinervis** (Liou), comb. nov.

Litsea Eberhardtii Liou var. *subtriplinervis* Liou, Laurac. Chine Indoch. 181. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. TONKIN: *P. Eberhardt 4949* (type of *Litsea Eberhardtii* var. *subtriplinervis*, Paris; photo. and fragm., AA).

The affinity between the species proper and the variety is very evident on examination of the types, the distinguishing

character being an approach to a triplinerviate condition at the leaf bases.

22. **Litsea lancilimba** Merr. Philip. Jour. Sci. **23**: 244. 1923; Liou, Laurac. Chine Indoch. 176. 1932.

DISTRIBUTION: French Indo-China (?) and southern China (Hainan).

CHINA. HAINAN: *F. A. McClure (C.C.C.) 9353* (type, Herb. Manila; photo., AA); *F. C. How 73219; N. K. Chun & C. L. Tso 44354; C. Wang 35362; H. Y. Liang 64800.*

I have seen no flowers of this species. The leaves are very striking, long-lanceolate, acuminate, more or less glaucous below, and green above. Liou reports this as occurring in French Indo-China, but I have found no specimen of it in the material I have examined.

23. **Litsea longipes** (Meissn.) Hook. f. Fl. Brit. Ind. **5**: 172. 1886; Lecomte, Fl. Gén. Indoch. **5**: 141. 1914; Liou, Laurac. Chine Indoch. 175. 1932.

Cylicodaphne longipes Meissn. in DC. Prodr. 15[1]: 205. 1864.

DISTRIBUTION: India and French Indo-China.

INDIA. MERGUI: *W. Griffith* (type, Kew); *Helfer, Kew Distrib. No. 4231* (cited by Hooker f.).

Lecomte has reported this from Indo-China, but I have seen no specimens from there. The species has very distinctive fruit when dried, borne in pedunculate umbels of threes, the cupule being 1.5 cm. in diam., very fleshy, and the pedicel 3 cm. long. On drying the cupule appears rugose. The leaves are large (20 × 8 cm.), coriaceous, elliptic, yellow-green above, glaucous below. Except for the numbers cited above, I have seen no material of *L. longipes*.

24. **Litsea Helferi** Hook. f. var. **laosensis** Liou, Laurac. Chine Indoch. 180. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. LAOS: *E. Poilane 2086* (type, Paris).

There does not appear to be a very close relationship between the two entities. Liou emphasizes the fact that in the variety the umbels are larger; the leaves are larger and more

coriaceous; the petioles are longer; the secondary nerves are impressed above, but show a slight elevation as well. These differences would be variations of degree only, if the plants were similar in other respects, which is not the case. The leaves of the variety are not symmetrical in outline, while those of the species proper are usually elliptical-ovate.

25. **Litsea eugenioides** A. Chev. in Liou, Laurac. Chine Indoch. 173. 1932.

DISTRIBUTION: known only from type locality?

FRENCH INDO-CHINA. ANNAM: *A. Chevalier 38667; E. Poilane 3658* (syntypes, Paris).

These two numbers constitute the only material seen of this species. The nearest related species seems to be *Litsea nitida* (Nees) Hook. f. from India. The unusual raised venation is characteristic of both species. The ♂ inflorescence of the latter is a full-flowered raceme. The ♀ inflorescence is shorter. The ♂ inflorescence of *L. eugenioides* is unknown; the ♀ inflorescence is a short axillary cluster of umbels or merely isolated umbels. The leaves of *L. nitida* are longer and more slender, and the venation less conspicuous on the lower surface than those of *L. eugenioides*. It is possible that there is one species only represented here, but I have for study only a portion of Wallich's type of *Tetranthera nitida* consisting of a ♂ branch. Before making any change of status more material is necessary.

26. **Litsea Liyuyingi** Liou, Bull. Soc. Bot. France, 80: 566, fig. 1. 1933.

DISTRIBUTION: known only from type locality.

CHINA. YUNNAN: *A. Henry 12839* (type, NY).

Liou has created, on the strength of this species, a new subgenus *Octolitsea,* because of the numerous stamens and the eight-parted perianth. It is a coarse-leaved species not unlike *L. honghoensis,* but differing from it in having an inflorescence of panicles of cymes.

27. **Litsea Panamonja** (Nees) Hook. f. Fl. Brit. Ind. 5: 175. 1886; Liou, Laurac. Chine Indoch. 175. 1932.

Tetranthera Panamonja Hamilt. in Wallich List No. 2553. 1830.
Tetranthera Panamanja Nees in Wall. Pl. As. Rar. 2: 67. 1831.

DISTRIBUTION: India and French Indo-China.
INDIA. SILHET: *N. Wallich 2553* (isotype, Kew, not seen; Gray, see footnote p. 370).
FRENCH INDO-CHINA. TONKIN: *P. Eberhardt 3241.*

A large-leaved penninerved species distinguished by its numerous racemes often 6 cm. long.

28. **Litsea Rehderiana**, spec. nov.

Arbor 15–18 m. alta, ramulis teretibus rugosis viridi-brunneis, glabris. Folia in apice ramulorum verticillata, subcoriacea, elliptica, 12–17 cm. longa, 4–6.5 cm. lata, acuta, acuminata vel subacuminata ad basin subrotundata, utrinque glabra, supra viridia, minute reticulata sub lente, subnitida, subtus pallida, glaucescentia, penninervia, nervis 7–9-jugis, supra pro ratione laminae coloris perspicuis sicut venulis flavis, subtus primo intuito obscurioribus sed prominulis, petiolis 12–30 mm. longis, glabris rugosis. Inflorescentia coarctata, racemosa, umbellam simulans. Flores ♂ immaturi, ut videtur generis, staminibus 9. Flores ♀ ignoti. Inflorescentia fructifera, 3–3.5 cm. longa, pedicellis 1–1.5 cm. longis. Fructus magnus, globosus, 2 cm. latus, rugosus, cupula glabra in sicco, 5–7 mm. longa, 10–12 mm. lata, in pedicellum clavatum 16–20 mm. longum et 4–6 mm. crassum, abrupte abeunte.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. ANNAM: *E. Poilane 24353, 23907* (type, Paris; photo. and fragm., AA).

A very striking species of *Litsea* on account of the enormous globose fruits which are borne in racemose clusters on the branches and are subtended by a thick enlarged calyx and pedicel, together forming a constricted funnel-shaped cupule. The reticulation of the upper surface of the leaf is unusual in that under a lens it appears yellowish, as do the veins, against the dark background of the leaf blade.

It gives me great pleasure to name this species in honor of Prof. Alfred Rehder, Curator of the Herbarium of the Arnold Arboretum, long renowned as an authority on oriental ligneous plants.

29. **Litsea Pierrei** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 83. 1913; Fl. Gén. Indoch. 5: 138. 1914; Liou, Laurac. Chine Indoch. 174. 1932.

Litsea Vang Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 84. 1913; Fl. Gén. Indoch. 5: 139. 1914; Liou, Laurac. Chine Indoch. 175. 1932, **syn. nov.**

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. COCHINCHINA: *L. Pierre 471, 5151* (syntypes of *Litsea Pierrei*, Paris); *L. Pierre 125* (type of *Litsea Vang*, Paris).

This is a species where the ovary is almost completely enclosed in the enlarged perianth tube or induvium, which in the young fruiting stage enlarges to almost surround the fruit. In the mature stage, the fruit protrudes from the spread calyx about one-half its length. This situation is comparable to that found in *Litsea baviensis* Lecomte from which *L. Pierrei* is distinguished by the smaller leaves, non-verrucose calyx and oblong fruit. It seems to be a difference in the age of the fruiting specimens which separates the two species of Lecomte, *L. Pierrei* and *L. Vang*. Hence, I have reduced the latter to *L. Pierrei* Lecomte.

29a. **Litsea Pierrei** Lecomte var. **grandifolia** (Lecomte), comb. nov.

Litsea Vang Lecomte var. *grandifolia* Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 84. 1913; Fl. Gén. Indoch. 5: 139. 1914; Liou, Laurac. Chine Indoch. 165. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. CAMBODIA: *L. Pierre 5152* (type, Paris).

This is a very large-leaved variety of the species.

29b. **Litsea Pierrei** Lecomte var. **lobata** (Lecomte), comb. nov.

Litsea Vang Lecomte var. *lobata* Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 84. 1913; Fl. Gén. Indoch. 5: 139. 1914; Liou, Laurac. Chine Indoch. 165. 1932.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. CAMBODIA: Ile Phu-Quoc, *L. Pierre 5150* (type, Paris).

The species and the variety are very similar. The lobing of the cupule mentioned by Lecomte is not apparent on the sheet

of the type at hand. The fruit of the variety is more broadly oblong than the fruit of the species. The leaves of the variety are more cuneate at the base and the venation more apparent on the upper surface. Otherwise, the two entities are similar.

30. **Litsea cambodiana** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 82, pl. 5. 1913; Fl. Gén. Indoch. **5**: 139, fig. 12. 1914; Liou, Laurac. Chine Indoch. 172. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. CAMBODIA: *Bordenave* (type, Paris).

A coarse species which is distinctive because of the extremely coriaceous leaves, which are truly elliptical, 10–15 cm. long and 4.5–7.5 cm. broad, penninerved, with nerves conspicuous only below, spreading and ascending at the tips. The inflorescence is racemose.

30a. **Litsea cambodiana** Lecomte var. **longiracemosa** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 82. 1913; Fl. Gén. Indoch. **5**: 141. 1914; Liou, Laurac. Chine Indoch. 173. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. COCHINCHINA: *L. Pierre 229* (type, Paris).

30b. **Litsea cambodiana** Lecomte var. **multiracemosa** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 82. 1913; Fl. Gén. Indoch. **5**: 141. 1914; Liou, Laurac. Chine Indoch. 173. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. CAMBODIA: *L. Pierre 1467a* (type, Paris).

The types of the two varieties proposed by Lecomte certainly show the differences mentioned by him in the original descriptions, but I feel very strongly that could an abundance of material from Indo-China be obtained, the three specimens cited above would fall into a series showing merely variations within the species proper. In the larger scope it is possible that the above species, *Litsea Pierrei* Lecomte, and *L. Vang* Lecomte might together constitute a single species with variations which one might put down as being due to ecological conditions.

31. **Litsea Thorelii** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 85. 1913; Fl. Gén. Indoch. **5**: 137. 1914; Liou, Laurac. Chine Indoch. 182. 1932.

DISTRIBUTION: India and French Indo-China.

FRENCH INDO-CHINA. COCHINCHINA: *M. C. Thorel 3367* (type, Paris).

A species with nearly linear leaves, crowded at the tips of the branches. The inflorescence consists of umbels reduced to one flower subtended by a broadly spreading "involucre." The species is similar to *Litsea pseudoelongata* Liou, but has broader leaves, shorter pedicels, and the bracts are covered with brownish pubescence.

32. **Litsea pseudoelongata** Liou, Laurac. Chine Indoch. 179, fig. 13. 1932.

DISTRIBUTION: China (Kwangtung and Hainan).

CHINA. KWANGTUNG: *Y. Tsiang 2590* (type, NY); *W. Y. Chun 7358* (sterile specimen).—HAINAN: *F. C. How 73869*.

The *How* specimen has immature fruit, too young to complete the description. The species recalls *Litsea Thorelii* Lecomte, from Cochinchina, but may be separated from the latter by longer, more numerous, more slender obtuse leaves; more numerous and more spreading veins, which are less conspicuous on the upper surface; and the cano-sericeous bracts subtending the umbels.

33. **Litsea glutinosa** (Lour.) C. B. Rob. Philip. Jour. Sci. Bot. **6**: 321. 1911; Chun, Contr. Biol. Lab. Sci. Soc. China 1^5: 62. 1925; Merr. Enum. Philip. Fl. Pl. **2**: 194. 1923; Trans. Am. Philos. Soc. n. ser. 24^2: 166 (Comm. Loureiro Fl. Cochinch.). 1935.

Sebifera glutinosa Lour. Fl. Cochinch. 638. 1790; ed. 2, 783. 1793.

Litsea Sebifera Pers. Syn. **2**: 4. 1807 (based on *Sebifera glutinosa* Lour.); Liou, Laurac. Chine Indoch. 196. 1932.

For complete synonymy see Merrill, l.c.

DISTRIBUTION: Tropical Asia to Malaysia.

FRENCH INDO-CHINA. ANNAM: *E. W. Squiers 351; J. & M. S. Clemens 3247*.

COCHINCHINA. *J. Loureiro* (type of *Sebifera glutinosa* not seen, Paris, Brit. Mus.).

CHINA. YUNNAN: *A. Henry 12223*, and *12223 A, B, C, D*, and *F*.

Over one hundred additional sheets of this species were examined, but they will not be listed here, since the species is very well known.

There occurs in this species variation in size and shape of leaf, and in the inflorescence, which is composed of many-flowered (8–10) umbels. The leaves are very prominently reticulate, glabrous above, with varying degrees of pubescence below (usually extremely pubescent). The flower perianths are incomplete through abortion.

33a. **Litsea glutinosa** (Lour.) C. B. Rob. var. **brideliifolia** (Hay.) Merr. Lingnaam Agr. Rev. 1^2: 84. 1923; Lingnan Sci. Jour. 5: 80. 1927.

Litsea brideliifolia Hay. Ic. Pl. Formos. 5: 166, fig. 58b. 1915.

Tetradenia brideliifolia (Hay.) Makino & Nemoto, Fl. Jap. ed. 2, 373. 1931.

Litsea Sebifera Pers. var. *brachyphylla* Hand.-Maz. Oest. Bot. Zeit. 80: 341. 1931.

DISTRIBUTION: southern Asia.

CHINA. HAINAN: *N. Konishi 70* (type of *Litsea brideliifolia* not seen, Taihoku Herb.); *H. Fenzel 4* (type of *Litsea Sebifera* var. *brachyphylla* not seen, Vienna); *A. Henry 8081, 8472; J. L. Gressitt 783, 1417; H. Y. Liang 63804; C. Wang 32724; S. K. Lau 22, 1583, 3539; Y. Tsiang 429; W. T. Tsang 177, 667; C. O. Levine 1248; W. Y. Chun 15; F. A. McClure 8984.*

FRENCH INDO-CHINA. ANNAM: *J. & M. S. Clemens 3305.*

Handel-Mazzetti, in a letter to Merrill, says: "*Litsea brideliaefolia* has, from the description, twigs and petioles hirsute, my plant at best puberulent, leaves with acute base, 7–8 pairs of nerves, mine with mostly rounded base and 5–6 pairs nerves. This may, however, be variable and that inexactly described."

34. **Litsea rotundifolia** Hemsl. Jour. Linn. Soc. Bot. 26: 385. 1891.

Laurus rotundifolia Wall. List. no. 2591. 1830, nomen nudum.

Iozoste rotundifolia Nees in Wall. Pl. As. Rar. 2: 63. 1831 (based on *Tetranthera rotundifolia* Wall.).

Tetranthera rotundifolia Wall. ex Nees l.c. in synon. (based on *Laurus rotundifolia* Wall.).

Actinodaphne chinensis var. *rotundifolia* Nees, Syst. Laurin. 600. 1836 (based on *Tetranthera rotundifolia* Wall.).

Iozoste chinensis var. *rotundifolia* Bl. Mus. Bot. Lugd.-Bat. 1: 364. 1851 (based on *Tetranthera rotundifolia* Wall.).

Actinodaphne rotundifolia Merr. Lingnan Sci. Jour. 15: 419. 1936, synon. pp., syn. nov.

DISTRIBUTION: southern China.

CHINA. *N. Wallich 2591* (isotype of *Iozoste* and *Tetranthera rotundifolia*, not seen, Kew, see footnote p. 370).—KWANGTUNG: *W. A. Harland* (type of *Litsea rotundifolia* Hemsl., Kew; photo., AA).

Except for the specimens cited above I have seen no material of the species proper. According to the International Rules, there is no reason why Hemsley's name should not be the one to be used, even though it by chance happens to be the same which the transfer of the oldest specific epithet would automatically give to the species. Inasmuch as Hemsley's name was published several years ago the specific epithet "rotundifolia" cannot now be transferred, since it would result in a later homonym. The species is easily distinguished by the rotund or ovate leaves, obtuse or acutish at the apex, with very distinct venation.

34a. **Litsea rotundifolia** Hemsl. var. **oblongifolia** (Nees), comb. nov.

Litsea chinensis Bl. Bijdr. 565. 1825, non Lam.

Iozoste rotundifolia Nees var. *oblongifolia* Nees in Hook. f. & Arnott, Bot. Beechey Voy. 209. 1836 (based on *Litsea chinensis* Bl.).

Actinodaphne chinensis var. *oblongifolia* Nees, Syst. Laurin. 600. 1836 (based on *Litsea chinensis* Bl.).

Iozoste chinensis Bl. Mus. Bot. Lugd.-Bat. 1: 364. 1851 (based on *Litsea chinensis* Bl.).

Actinodaphne chinensis Nees, Syst. Laurin. 600. 1836; Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 93. 1913; Liou, Laurac. Chine Indoch. 159. 1932.

Blume's type of *Litsea chinensis* not seen, Leiden.

DISTRIBUTION: southern and eastern China and possibly French Indo-China.

CHINA. KWANGTUNG: *W. Y. Chun 7506* (type, AA); *C. O. Levine 8, 437, 567, 992, 1250, 1619, 1622, 1824* (some of the leaves of this specimen are very nearly rotund, others are oblong, which shows the rather artificial separation of the variety from the species), *3009, 3064; C. O. Levine & G. W. Groff 85; W. T. Tsang 16502, 21199, 21210, 21562; Y. Tsiang 887, 888, 890, 1502, 1529.*—HAINAN: *F. C. How 73606.*—FUKIEN: *H. H. Chung 1054, 2175, 2233, 4522, 6871; S. G. Tang 5347, 6784; S. P. Wong 12298; O. Warburg 5839.*—KWANGSI: *R. C. Ching 7856* (very small-leaved specimen).

FRENCH INDO-CHINA. TONKIN: *B. Balansa 4756?*

The variety is similar to the species except for the leaves of the former being oblong or elliptic rather than rotund.

The variety has been known in herbaria as *Litsea* or *Actinodaphne chinensis.* The material which has come to my attention has proved to be a mixture of two different elements: the variety proper, the majority of the specimens of which are from Kwangtung and Fukien; and *Actinodaphne lancifolia*

var. *sinensis* Allen. Because there has been a confusion in determination for so long, I have cited above all of the recent collections of *Litsea rotundifolia oblongifolia*, duplicates of which appear in the various herbaria throughout the world. Specimens belonging to *Actinodaphne* will likewise be cited under that genus.

35. **Litsea firma** Hook. f. var. **austrannamensis** Liou, Laurac. Chine Indoch. 191. 1932.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. ANNAM: *A. Chevalier 38727* (type, Paris; photo., AA).

Only a photograph of this variety has been seen. It differs from the species proper (fide Liou) in having smaller leaves, petioles and umbels, and fewer secondary nerves.

36. **Litsea monopetala** (Roxb.) Pers. Syn. 2: 4. 1807.

Tetranthera monopetala Roxb. Pl. Corom. 2: 26, pl. 148. 1798; Nees in Wall. Pl. As. Rar. 2: 66. 1831; Meissn. in DC. Prodr. 15¹: 189. 1864.
Tetranthera macrophylla Roxb. Hort. Bengal. 73. 1814.
Tetranthera macrophylla Roxb. in Wall. List No. 2549. 1830.
Litsea polyantha Juss. Ann. Mus. Hist. Nat. Paris, 6: 211. 1805; Hook. f. Fl. Brit. Ind. 5: 162. 1886; Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 89. 1913; Fl. Gén. Indoch. 5: 135. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China. 1⁵: 63. 1925; Liou, Laurac. Chine Indoch. 192. 1932.
Tetranthera polyantha Wall. List No. 2538. 1830, nomen nudum; ex Nees in Wall. Pl. As. Rar. 2: 67. 1831.

DISTRIBUTION: southern Asia and Pacific Islands.
INDIA. SILHET: *N. Wallich 2538* (isotype of *Tetranthera polyantha* not seen, Kew, see footnote p. 370); *N. Wallich 2549* (isotype of *T. macrophylla* Roxb., Kew, Gray).
CHINA. YUNNAN: *H. T. Tsai* [*55027, 55039, 55052, 56682*], *60712, 60854; A. Henry 11794, 12005.*—HAINAN: *S. K. Lau 1385, 1326; W. T. Tsang & H. Fung 208; W. T. Tsang 121, 610; H. Fung 20059; H. Y. Liang 61952, 64190; C. Wang 35741, 36185; F. C. How 71318, 71691.*
FRENCH INDO-CHINA. ANNAM: *E. Poilane* [*24733*]; *A. Chevalier* [*40449*].—WITHOUT LOCALITY: *E. Poilane* [*21772*].

The species is characterized by the soft rusty pubescence of the inflorescence and the under surface of the ovate or obovate to oval-oblong leaves. The inflorescence consists of numerous pedunculate umbels. The above specimens from China and Indo-China are bracketed because they conform to the typical *L. monopetala* in spite of having glabrous to glabrescent leaves

and branchlets. At this point attention should be called to the variety *glabra* from Hainan which Liou published under *Litsea polyantha*. This has no affinity either in leaf or fruit character which could place it near *L. polyantha*. Its proper position seems to be as a variety of *L. salicifolia*, which species see for discussion.

37. **Litsea Wilsonii** Gamble in Sargent, Pl. Wilson. 2: 78. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China 1[5]: 61. 1925; Liou, Laurac. Chine Indoch. 191. 1932.

DISTRIBUTION: China (Szechuan).

CHINA. SZECHUAN: *E. H. Wilson 3694; Veitch Exped. 4422, 4422a* (syntypes, Kew; isotypes, AA); *W. P. Fang 2292, 2297, 2526; F. T. Wang 20579.*

The species is recognized at once by the tawny brown velutinous under surface of the obovate to oval leaves. The petioles are long, and the branches are minutely pubescent. The inflorescence consists of pedunculate axillary umbels, topped with shallow crenulate discs which subtend the ellipsoid fruit (1 cm. × 6–7 mm.).

38. **Litsea Garrettii** Gamble, Kew Bull. 1913: 204; Liou, Laurac. Chine Indoch. 196. 1932.

DISTRIBUTION: Siam and China.

SIAM: *H. B. G. Garrett 63* (syntype, Kew); *A. F. G. Kerr 880* (syntype, Kew); *A. F. G. Kerr 2541, 2602* (syntype not seen, Kew).

CHINA. YUNNAN: *A. Henry 11649, 11649 D, E, F, G, H, I; J. F. Rock 2661; H. T. Tsai 53253.*

The species is characterized by a racemose inflorescence and elliptic leaves approximately 12 cm. long, very long-attenuate, acuminate, with a tendency towards caudate, slightly falcate tips.

38a. **Litsea Garrettii** Gamble var. **longistaminata** Liou, Laurac. Chine Indoch. 196. 1932.

DISTRIBUTION: China (Yunnan).

CHINA. YUNNAN: *A. Henry 12802, 12769* (syntypes, Paris; isotypes, AA); *J. F. Rock 2595?*

A variety which has in common with *L. Dunniana* Lévl. long-exserted stamens. No fruiting specimen has thus far been reported. *Rock no. 2595* has been questionably placed here. The

specimen is glabrescent and in very young fruiting stage. It is too immature, however, for the basis of a complete description of the fruit.

39. **Litsea acutivena** Hay. Ic. Pl. Formos. **5**: 163, fig. 58d. 1915; Kaneh. Formosan Trees, 439. 1917; Ouchi, Sylvia **3**: 142, pl. 4, fig. 3. 1932; Merr. Lingnan Sci. Jour. **15**: 418. 1936.

DISTRIBUTION: Formosa, southern China and Indo-China.

FORMOSA: *B. Hayata & S. Sasaki*, Mt. Arisan, Jan. 1912 (type not seen, Tokyo Herb.).

CHINA. HAINAN: *F. C. How 73416; C. Wang 33352.*—KWANGTUNG: *C. Ford*, Hongkong (as *Lindera bifaria* Benth.); *W. T. Tsang 21455.*—KWANGSI: *W. T. Tsang 22758.*

FRENCH INDO-CHINA. LAOS: *E. Poilane 15688.*

The leaves of this *Litsea* are lanceolate, oblanceolate or oblong-lanceolate, about 12 cm. long and 3.5 cm. broad, glabrous above and pubescent below. The venation is very prominent on the lower surface. The specimen from Laos has larger leaves, but in other respects agrees with the Chinese material.

40. **Litsea Kobuskiana** Allen, Jour. Arnold Arb. **18**: 290. 1937, nom. nov.

Litsea Esquirolii (Lévl.) Allen, Jour. Arnold Arb. **17**: 329. 1936.
Eurya Esquirolii Lévl. Fl. Kouy-Tchéou, 415. 1915, nomen nudum.
Neolitsea spec. Rehd. Jour. Arnold Arb. **10**: 193. 1929.
Litsea Faberi Hemsl. var. *ganchouensis* Liou, Laurac. Chine Indoch. 187. 1932, syn. nov.

DISTRIBUTION: western China.

CHINA. KWEICHOW: Gan chouen, *J. Cavalerie (Esquirol?) 3893*, in 1912 (type of *Eurya Esquirolii*, Edinburgh; isotype AA, and also type of *Litsea Faberi ganchouensis* Liou, Paris).—SZECHUAN: *C. Bock & A. von Rosthorn 276* (sterile specimen but probably belongs here).

This is characterized by oblong-lanceolate, attenuately acuminate leaves 7–10 cm. long and over 2 cm. broad, glabrous and shining above, slightly puberulous below. The leaves are penninerved and coarsely reticulate. The branchlets and petioles are pubescent, gradually becoming puberulous. The specimen of *Eurya Esquirolii* Lévl. in the Léveillé Herbarium collected in Gan chouen under the number *3893*, was without collector's name. It was supposed, since the label was similar to those frequently used by Esquirol and since Léveillé named it

after Esquirol, that the latter was the collector. Cavalerie's name, however, was on the Paris specimen as evidenced by an examination of the type of Liou's variety of *Litsea Faberi* Hemsl. The leaf shape of the latter species is similar to that of *Cavalerie 3893,* but there the similarity ends. They differ in pubescence of the leaves, in their venation and reticulation. The name *Litsea Esquirolii* (Lévl.) Allen goes to synonymy because it is preoccupied. (See "Excluded Species.")

The species is named in honor of Dr. C. E. Kobuski, Assistant Curator of the Arnold Arboretum, who has made an intensive study of the genus *Eurya.*

41. **Litsea Faberi** Hemsl. Jour. Linn. Soc. Bot. **26**: 381. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China, 1^5: 63. 1925; Liou, Laurac. Chine Indoch. 187. 1932.

DISTRIBUTION: China (Szechuan and Kiangsi).

CHINA. SZECHUAN: *E. Faber 341* (type, Kew; isotype, AA).—KIANGSI: *C. Y. Hwang 12* (AA).

A species very similar to *Litsea Kobuskiana,* but separated at once by the presence of more numerous pairs of veins deeply impressed on the upper surface, and also by the absence of obvious reticulations.

42. **Litsea elongata** (Wall. ex Nees) Benth. & Hook. f. Gen. Pl. **3**: 163 (in nota sub *Lindera).* 1880; Hook. f. Fl. Brit. Ind. **5**: 165. 1886; Chun, Contr. Biol. Lab. Sci. Soc. China, 1^5: 62. 1925; Liou, Laurac. Chine Indoch. 195. 1932; Merr. Lingnan Sci. Jour. **15**: 418. 1936.

Tetranthera elongata Wall. List. No. 2546. 1830, nomen nudum.
Daphnidium elongatum Nees in Wall. Pl. As. Rar. **2**: 63. 1831.

DISTRIBUTION: India to China and Tibet.

INDIA. NEPAL: *N. Wallich 2546* (isotype, Kew, see footnote p. 370).

CHINA. SZECHUAN: *F. T. Wang 22706, 23495.*—KWEICHOW: *W. Y. Chun 6433; A. N. Steward, C. Y. Chiao & H. C. Cheo 430.*—HUPEH: *H. C. Chow 1254.*—HUNAN: *H. Handel-Mazzetti 11152.*—ANHWEI: *R. C. Ching 2935.*

This species has been confused with *Litsea Faberi* Hemsl. from Kwangtung, from which it is distinguished by the elongated oblong-lanceolate or oblanceolate penninerved leaves,

acuminate, pubescent below; and the ellipsoid apiculate pedunculate fruit 10 mm. × 6 mm.

42a. **Litsea elongata** (Wall. ex Nees) Benth. & Hook. f. var. **cuneifolia** Liou, Laurac. Chine Indoch. 195. 1932.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. TONKIN: *E. Poilane 12809* (type, Paris).

The variety is unusual in its almost complete lack of pubescence on the branchlets and leaves; the uniform shape of the latter; and the subsessile umbels.

43. **Litsea hupehana** Hemsl. Jour. Linn. Soc. Bot. **26**: 382. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 64. 1925; Liou, Laurac. Chine Indoch. 178. 1932.

DISTRIBUTION: known only from type locality.
CHINA. HUPEH: *A. Henry 6607, 6660* (syntypes, Kew; isotypes, Gray).

A species with crowded alternate leaves which are oblong-elliptic, glabrous above, glaucous below, the midrib reddish yellow, numerous pairs of slender nerves scarcely ascending, inconspicuous above and below. The type material which I have consists of staminate specimens in the early flowering stage. It is too soon to tell whether or not the bracts are caducous. However, there seems to be a strong resemblance to the genus *Actinodaphne*. (See *Actinodaphne Lecomtei* Allen for discussion in detail.)

44. **Litsea Dunniana** Lévl. Fedde, Rep. Spec. Nov. **9**: 460. 1911; Fl. Kouy-Tchéou, 220. 1914; Allen, Jour. Arnold Arb. **17**: 329. 1936.

Neolitsea spec. Rehd. Jour. Arnold Arb. **10**: 193. 1929.

DISTRIBUTION: known only from type locality.
CHINA. KWEICHOW: *J. Esquirol 565* (type of *Litsea Dunniana*, Paris; photo. and fragm., AA).

The species is characterized by the sessile inflorescence and long-exserted stamens; the large penninerved oblong-lanceolate leaves, the lower surface of which is covered with long slightly villous hairs. Attention has already been drawn to the similarity of *L. Dunniana* Lévl. to *L. Garrettii* Gamble var. *longistaminata* Liou. (See Allen, l.c.)

45. **Litsea mekongensis** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V, 5: 84. 1913; Fl. Gén. Indoch. 5: 134. 1914; Liou, Laurac. Chine Indoch. 190. 1932.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. LAOS: Mekong, *M. C. Thorel*, in 1866–68 (type, Paris).

This species is very distinctive in having large lanceolate-elliptic leaves 25–30 cm. long, acute or sub-acuminate, glabrous above except the midrib, fulvo-pubescent on veins below. The branchlets are also pubescent.

46. **Litsea viridis** Liou, Laurac. Chine Indoch. 188, fig. 14. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. ANNAM: *E. Poilane 1466* (type, Paris).

An unusual species with pale dull leaves prominently reticulate above and glabrescent below; with very large glands surrounding the filament, and with mucronate anthers which are often atrophied.

46a. **Litsea viridis** Liou var. **Clemensii** Liou, Laurac. Chine Indoch. 190. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. ANNAM: *J. & M. S. Clemens 3893* (type, Paris; isotype, AA); *E. Poilane 6989* (young fruiting specimen).

The leaves of the variety are larger than those of the species, more attenuate-acuminate and oval-elliptic, the petiole longer and thicker. The fruiting inflorescence consists of two (sometimes three) fruits practically sessile on the common peduncle; the peduncles are numerous and in fasciculate arrangement; the fruits are oblong-apiculate, borne loosely in shallow somewhat fluted cupules, nearly disc-shaped.

47. **Litsea iteodaphne** (Nees) Hook. f. Fl. Brit. Ind. 5: 173. 1886.

Tetranthera iteodaphne Nees, Syst. Laurin. 542. 1836; Thwaites, Enum. Ceylon Pl. 255. 1861.

DISTRIBUTION: Ceylon and French Indo-China.
CEYLON: *G. H. K. Thwaites 10* (type of *Tetranthera iteodaphne* not seen, Berlin (†); isotype, Gray); *G. H. K. Thwaites 351, 729, 2487.*

FRENCH INDO-CHINA. ANNAM: *E. Poilane 23670, 21826, 21858.*—LAOS: *E. Poilane 26323.*

47a. **Litsea iteodaphne** (Nees) Hook. f., f. **chinensis**, f. nov. A typo differt foliis variabilibus, subacuminatis, venis reticulationibusque inconspicuis, et inflorescentia breviore.

DISTRIBUTION: China.

CHINA. KWANGSI: *W. T. Tsang 22551* (type, AA).—HAINAN: *F. C. How 73779, 72016, 72151, 72216, 72503.*

The variety differs from the species in that the leaves are subacuminate, the venation and reticulation very inconspicuous, and the inflorescence shorter. The specimens from Hainan are variable in the size of the leaves. In fact, these have been confused with *Litsea variabilis*, from which they differ in leaf shape and reticulation. The latter has oblanceolate obtuse leaves as opposed to the usually oblong-linear acute or subacuminate leaves found in *L. iteodaphne* and its variety. *Litsea variabilis* has very prominently reticulated leaves, whereas in *L. iteodaphne* the reticulation is obscure. The branches of *L. variabilis* are puberulous; those of *L. iteodaphne* are usually, though not always, glabrous at maturity.

48. **Litsea variabilis** Hemsl. Jour. Linn. Soc. Bot. **26**: 386. 1891; Liou, Laurac. Chine Indoch. 188. 1932.

DISTRIBUTION: French Indo-China and China.

CHINA. HAINAN: *A. Henry 4, 8540, 8729* (syntypes, Kew), *8431* (syntype, Kew; isotype, Gray); *W. T. Tsang 140, 174, 87, 325, 482, 506, 507, 707; C. Wang 33169, 33272; H. Y. Liang 62156, 61717, 61516, 61565, 62742, 63093, 64294; S. K. Lau 332, 122, 1009, 1389, 1411, 1455, 1801, 2871, 3549; F. C. How 71050; H. Fung 20145; F. C. How & N. K. Chun 70099, 70261, 70155*, etc.

A species with great variability in leaf shape and thickness of petiole. The leaf varies from oblanceolate to broadly ovate, acutish to obtuse to emarginate. The leaves are prominently reticulate and the branches greyish puberulous.

48a. **Litsea variabilis** Hemsl. var. **oblonga** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 90. 1913.

Litsea variabilis Hemsl. var. *tonkinensis* Lecomte, Fl. Gén. Indoch. **5**: 136. 1914, syn. nov.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. TONKIN: *B. Balansa 2404, 2407* (syntypes of *Litsea variabilis* var. *oblonga*, Paris).

The variety has more graceful branches, more membranaceous leaves, not as variable as the species proper, but elliptic, acute to subacuminate, with the reticulations less obvious.

The variety *oblonga* was described in 1913, with the following numbers cited, collected by Balansa: *Nos. 2402, 2403, 2404, 2405, 2406* and *2407*. The herbarium specimens of *Nos. 2404, 2405* and *2407* (the only ones at present available) have the varietal name *oblongifolia* Lecomte written in and crossed out, var. *tonkinensis* replacing it. It would seem that Lecomte had forgotten his earlier name or disregarded it entirely. Of the three numbers at hand, *Nos. 2404* and *2407* are the same. They show an affinity for *L. variabilis* proper and doubtless represent the typical Indochinese variety. *Number 2405*, however, has no connection with *Litsea variabilis* but seems rather to be near *Litsea chartacea*. Until the remaining numbers cited by Lecomte are seen, no attempt at placing *No. 2405* will be made.

49. **Litsea Greenmaniana**, spec. nov.

Arbor circa 6 m. alta, ramulis teretibus rubro-brunneis leviter striatis gracilioribus ex glabrescentibus glabris. Folia alterna, leviter membranacea, elliptica vel suboblanceolata, 7–11 cm. longa, 2.2–3.5 cm. lata, acuminata, saepe falcata, ad basin acuta, pallide viridia, concoloria, supra nitida, subtus opaca, glabra, bene reticulata, penninervia, nervis circiter 10-jugis utrinque prominulis, subtus crassioribus, petiolis 8–15 mm. longis glabrescentibus et brunnescentibus. Subumbellae in quaque inflorescentia 1–4, pedunculatae, pauciflorae, pedunculis 2–3 mm. longis. Flores pubescentes: ♂ perianthii tubo brevissimo, lobis 6 ellipticis, staminibus 9, filamentis pubescentibus. Flores ♀ ex anthesi fere peracta, haud eruendi. Fructus immaturus, cupula pedicelloque dense pubescentibus.

DISTRIBUTION: southeastern China.

CHINA. KWANGTUNG: *W. T. Tsang 21102* (type, AA), *21229; H. Fung A542 (18947).*—KIANGSI: *S. K. Lau 4754.*—FUKIEN: *J. L. Gressitt 1687.*

The unusual feature of this species is the very conspicuous reticulation and the shining upper-surface of the leaves, the

combination giving a viscid appearance. The reddish appearance of the branchlets, and at times the veins, is a distinguishing characteristic. The ♀ flowers are rather far advanced to have retained any characters valuable for diagnosis. The species is named for Dr. J. M. Greenman, Curator of the Herbarium at Missouri Botanical Garden, to whom this paper is dedicated.

50. **Litsea lancifolia** (Roxb.) Benth. & Hook. f. ex F.-Villar in Blanco, Fl. Filip. ed. 3, **4**: (Nov. App.) 181. 1880 (based on *Tetranthera lancifolia* Roxb.); Hook. f. Fl. Brit. Ind. **5**: 159. 1886 (based on *T. lancifolia* Roxb., Wallich List No. 2532, excl. W. Griffith's spec.); Hemsl. Jour. Linn. Soc. Bot. **26**: 382. 1891 (pro parte); Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 90. 1913; Fl. Gén. Indoch. **5**: 134. 1914.

Tetranthera lanceofolia Roxb. Hort. Bengal. 73. 1814, nomen nudum.
Tetranthera lancifolia Roxb. ex Wall. List No. 2532. 1830, nomen nudum; ex Nees in Wall. Pl. As. Rar. **2**: 65. 1831; Miq. Fl. Ind. Bat. 1^1: 944. 1858.

DISTRIBUTION: India to China, and reputedly Sumatra.

INDIA. SILHET: *N. Wallich 2532* (isotype of *Tetranthera lancifolia*, Kew, Gray, see footnote p. 370).

CHINA. HAINAN: *F. C. How 73261.*

Litsea lancifolia has elliptic, acute or acuminate leaves approximately 10 × 3 cm., membranaceous, penninerved, glabrescent above, glaucous and softly pubescent below. The branches are ferrugineous-tomentose. The above name was originally given by Roxburgh to *Tetranthera* as a *nomen nudum* in his 'Hort. Bengal.' in 1814. Wallich's 'List,' No. 2532 was first associated with a description by Nees in Wallich, 'Pl. As. Rar.' in 1831. Miquel in 1858 draws attention to the fact that the two plants are not the same. He treats Wallich's specimen as *T. lancifolia* F.-Villar and accepts his determination. Hemsley includes *Actinodaphne lancifolia* and its attending synonymy under *Litsea lancifolia* F.-Villar. Bentham and Hooker f. did not use this binomial in the 'Genera Plantarum.' Thus the combination must be cited as above. The species is supposedly found in Sumatra, but the latter material does not conform to the type material. It is rather nearer its variety *borneensis* (Meissn.) Boerl.

50a. **Litsea lancifolia** (Roxb.) Benth. & Hook. f. ex F.-Villar var. **pedicellata** Hook. f. Fl. Brit. Ind. 5: 159. 1886.

DISTRIBUTION: India and China.

INDIA. TENASSERIM OR ANDAMAN ISLANDS: *Helfer, Kew Distrib. No. 4306* (type, Kew; isotype, Gray).

CHINA. YUNNAN: *A. Henry 10759, 11143, 12301 A-C, 12235; H. T. Tsai 55301, 55330, 60286, 60337, 60520, 62133.*

The specimens from Yunnan all seem to be the variety rather than the species in that they are more glabrous and have the very slender, longer peduncles of the type of the former. Actually, the varietal name is a misnomer. The peduncles of the umbels are very apparent, and it is evidently this fact that Hooker had in mind in naming the variety.

51. **Litsea Balansae** Lecomte, Fl. Gén. Indoch. 5: 135. 1914; Liou, Laurac. Chine Indoch. 191. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. TONKIN: *B. Balansa 3196* (type not seen, Paris; photo., AA).

Litsea Balansae is a small-leaved species with leaves less than 8 cm. long and under 3 cm. broad, glabrous above, pubescent below, and penninerved with 6–7 pairs of nerves more prominent on the lower surface than on the upper. This species was described from a ♀ specimen only. Liou has placed it in the same group with *Litsea umbellata* (Lour.) Merr. Until more material is collected and further study made, no definite disposition of the species can be proposed. It is very probable that the plant may be a *Lindera*. The photograph shows the habit to be similar to that of *Lindera laureola* Coll. & Hemsl.

52. **Litsea umbellata** (Lour.) Merr. Philip. Jour. Sci. Bot. **14**: 242. 1919; Trans. Am. Philos. Soc. n.ser. **24**^{2}: 167 (Comm. Loureiro Fl. Cochinch.). 1935.

Hexanthus umbellatus Lour. Fl. Cochinch. 196. 1790; ed. 2. 242. 1793; Moore, Jour. Bot. **53**: 254. 1925.

Litsea hexantha Juss. Ann. Mus. Hist. Nat. Paris, **6**: 212. 1805 (based on *Hexanthus umbellatus* Lour.).

Tetranthera ferruginea R. Br. Prodr. 403. 1810, pp. *quoad syn.* Lour.

Litsea amara Bl. Bijdr. 563. 1825; Lecomte, Fl. Gén. Indoch. 5: 136. 1914; Liou, Laurac. Chine Indoch. 190. 1932.

Tetranthera amara Nees, Syst. Laurin. 551. 1836.

DISTRIBUTION: India and French Indo-China to China, Sumatra, Java and Borneo.

JAVA. (type of *Litsea amara* not seen, Herb. Leiden.)

FRENCH INDO-CHINA. ANNAM: Hue, *J. Loureiro* (type of *Hexanthus umbellatus* not seen, Brit. Mus.); *J. & M. S. Clemens 3169; E. Poilane 22273.*—TONKIN: *P. Eberhardt 3969.*—LAOS: *E. Poilane 20545.*—CAMBODIA: *Bejèaud 83.*—COCHIN-CHINA: *E. Poilane 19571.*

CHINA. KWANGSI: *W. T. Tsang 21836.*

Usually *Litsea umbellata* is recognized by the oblong-oval or elliptic leaves, apiculate or acuminate, and covered on the lower surface with red-brown tomentum, in contrast to the bright green upper surface (usually discernible even in the dried specimens). Since this species is polymorphic, the numerous varieties of Meissner and Hooker are not treated. It is possible that some of these, though described from the Islands and the Malay Peninsula, may be found in Indochina. The variation within the species is so great, however, and the species so easily distinguished, that no attempt will be made here to separate them.

DOUBTFUL SPECIES

Litsea salicifolia (Roxb.) Hook. f. Fl. Brit. Ind. **5**: 167. 1886; Liou, Laurac. Chine Indoch. 180. 1932.

Tetranthera salicifolia Roxb. ex Wall. List No. 2536A, pp., B, C. 1830, nomen nudum; ex Nees in Wall. Pl. As. Rar. **2**: 66. 1831.

DISTRIBUTION: India, and possibly French Indo-China. Liou cites the species as occurring in Tibet.

INDIA: *N. Wallich 2536A*, ex parte, *B, C*, (isotype of *Tetranthera salicifolia* not seen, Kew, see footnote p. 370).

The species is characterized by oblong-elliptic leaves 11–20 cm. long, 2.5–5.5 cm. broad, and ellipsoid fruit 10–11 mm. long.

Litsea salicifolia (Roxb.) Hook. f. var. **attenuata** (Meissn.) Hook. f. Fl. Brit. Ind. **5**: 168. 1886.

Tetranthera glauca var. *attenuata* Meissn. in DC. Prodr. 15¹: 185. 1864.

Tetranthera attenuata Wall. List No. 2534. 1830, nomen nudum; ex Nees in Wall. Pl. As. Rar. **2**: 66. 1831.

DISTRIBUTION: India and Tibet.

INDIA. SILHET: *N. Wallich 2534* (isotype of *Tetranthera attenuata*, Kew, NY, see footnote p. 370).

Nees, in Wallich, 'Pl. As. Rar.' **2**: 66–7. 1831, described *Tetranthera glauca, T. salicifolia* and *T. saligna* as species. *T. saligna* is based on *T. angustifolia* Wallich, 'List,' but the name is changed to *saligna* because *Litsea angustifolium* Blume has already been described. Meissner, in DC. 'Prodromus' **15**[1]: 183, 185. 1864, recognizes *T. angustifolia* and *T. glauca, T. saligna* in part being in synonymy under *T. angustifolia,* and in part being a variety of *T. glauca. T. salicifolia* is split up under the several varieties of *T. glauca.* Hooker, also, recognizes the same *T. glauca,* but transfers it to *Litsea.* However, Hooker retains the specific name of *salicifolia* under *Litsea,* keeping the same varieties under the latter species that Meissner had under *T. glauca.* Having at hand no type of *T. salicifolia* proper or of *T. angustifolia* and only two of the varieties under *T. glauca,* the synonymy cannot at present be straightened out. It remains to wait until the Indian types of all are available, before such an attempt is made. Liou reports the species *L. salicifolia* as occurring in Tibet, hence its inclusion in the present treatment. I have not seen any material outside of India that I would place in the species.

Litsea salicifolia (Roxb.) Hook. f. f. **glabra** (Liou), comb. nov.

Litsea polyantha Jussieu f. *glabra* Liou, Laurac. Chine Indoch. 193. 1932.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: *W. T. Tsang & H. Fung 634* (type of *Litsea polyantha glabra,* Paris; isotype, AA); *F. C. How 72093, 72537, 72739.*

Since *Litsea salicifolia,* though its status is as yet uncertain, obviously is the nearest relative of the f. *glabra* of Liou, the above combination has been made to denote the position of the latter in the genus.

EXCLUDED SPECIES AND VARIETIES

Litsea aurata Hay. Jour. Coll. Sci. Tokyo, **30**: 246 (Mater. Fl. Formosa). 1911 = **Neolitsea aurata** (Hay.) Merr.

Litsea Cavaleriei Lévl. in Fedde. Rep. Spec. Nov. **10**: 371, 1912 = **Lindera communis** Hemsl.

Litsea Chaffanjoni Lévl. in Fedde, Rep. Spec. Nov. **12**: 182. 1913 = **Symplocos stellaris** Brand.

Litsea confertifolia Hemsl. Jour. Linn. Soc. Bot. **26**: 379. 1891 = **Neolitsea confertifolia** (Hemsl.) Merr.

Litsea consimilis Nees, Syst. Laurin. 628. 1836 = **Neolitsea umbrosa** (Wall.) Gamble.

Litsea coreana Lévl. in Fedde, Rep. Spec. Nov. **10**: 370. 1912 = **Machilus Thunbergii** Sieb. & Zucc.

Litsea cupularis Hemsl. Jour. Linn. Soc. Bot. **26**: 380. 1891 = **Actinodaphne cupularis** (Hemsl.) Gamble.

Litsea Esquirolii Lévl. in Fedde, Rep. Spec. Nov. **9**: 459. 1911 = **Lindera communis** Hemsl.

Litsea fruticosa Gamble[1] = **Lindera fruticosa** Hemsl.

Litsea glauca Sieb. Verh. Bat. Genoot. **12**: 24. 1830 = **Neolitsea Sieboldii** (O. Ktze.) Nakai.

Litsea gracilipes Hemsl. Jour. Linn. Soc. Bot. **26**: 381. 1891 = **Neolitsea wushanica** (Chun) Merr.

Litsea hupehana Hemsl. var. *longifolia* Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 88. 1913 = **Actinodaphne Lecomtei**, spec. nov. (see p. 413).

Litsea laxiflora Hemsl. Jour. Linn. Soc. Bot. **26**: 383. 1891 = **Sassafras Tzumu** Hemsl.

Litsea Mairei Lévl. Cat. Pl. Yun-Nan, 150. 1916 = **Myrica adenophora** Hance.

Litsea myricopsis Lévl. Cat. Pl. Yun-Nan, 150. 1916 = **Myrica esculenta** Ham. ex Don.

Litsea obovata Nees, Syst. Laurin. 636. 1836 = **Actinodaphne obovata** Bl.

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[1] **Lindera fruticosa** Hemsl. Jour. Linn. Soc. Bot. **26**: 388. 1891.

Litsea fruticosa Gamble in Sargent, Pl. Wilson. **2**: 77. 1914; Liou, Laurac. Chine Indoch. 171. 1932.

Benzoin fruticosum (Hemsl.) Rehd. Jour. Arnold Arb. **1**: 145. 1919; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[8]: 42. 1925.

DISTRIBUTION: China.

CHINA. HUPEH: *A. Henry 4750, 6571* (syntypes, Kew; isotypes, Gray).—HONAN: *J. Hers* for *E. H. Wilson 40*, in 1918 (♂ specimen in AA).

These specimens are fruiting branches and ♀ flowers respectively. Gamble based his new combination on Wilson's *1636, 1659* from Kiangsi, *3670*, and *Veitch 1946* from Hupeh, and *4587* from Szechuan. The *Veitch No. 1946* I have not seen. Numbers *1636, 1659*, and *3670* are fruiting specimens. Number *4587* has ♂ flowers in few-flowered, practically sessile glomerules, and has four-celled anthers, which latter was the basis of Gamble's assumption that the plant was a *Litsea*. But the anther cells, instead of being one pair above the other, are one pair introrse, the second pair laterally extrorse. This number, hence, must be placed in the genus *Neocinnamomum*. Thus the name *Lindera fruticosa* stands. *Hers* for *Wilson Number 40* shows a typical *Lindera* flower with two-celled anthers. The infrutescence of *Lindera fruticosa* is the typical pedunculate umbel with numerous fruits. The fruit of *Neocinnamomum* has the enlarged calyx typical of *Cinnamomum*. Geographically the two are separate, *Neocinnamomum* occurring in the western part of China, and India, and *Lindera fruticosa* found in central and eastern China.

Litsea Playfairii Hemsl.[1] = **Lindera Playfairii** (Hemsl.), comb. nov.

Litsea pulchella Meissn. in DC. Prodr. **15**[1]: 224. 1864 = **Neolitsea pulchella** (Meissn.) Merr.

Litsea shweliensis W. W. Sm. Notes Bot. Gard. Edinb. **13**: 167. 1921 = **Actinodaphne confertiflora** Meissn.

Litsea touyunensis Lévl. in Fedde, Rep. Spec. Nov. **11**: 63. 1912 = **Lindera megaphylla** Hemsl. f. **touyunensis** (Lévl.) Rehd.

Litsea umbrosa Nees, Syst. Laurin. 623. 1836 = **Neolitsea umbrosa** (Wall.) Gamble.

Litsea undulatifolia Lévl. Fl. Kouy-Tchéou, 220. 1914 = **Neolitsea undulatifolia** (Lévl.) Allen.

Litsea wushanica Chun, Jour. Arnold Arb. **9**: 153. 1928 = **Neolitsea wushanica** (Chun) Merr.

Litsea zeylanica Nees, Amoen. Bot. Bonn. fasc. 1: 58, pl. 5 (Cinn. Disput.). 1823 = **Neolitsea zeylanica** (Nees) Merr.

Litsea zeylanica Nees var. *chinensis* Benth. in Hook. f. Jour. Kew Gard. Miscel. **5**: 199. 1853 = **Neolitsea pulchella** (Meissn.) Merr.

KEY TO THE SPECIES OF ACTINODAPHNE

1. Leaves triplinerved.....1. *A. confertiflora*
1. Leaves penninerved.
  2. Fruit pubescent.....2. *A. trichocarpa*
  2. Fruit glabrous.
    3. Leaves obovate.
      4. Leaves 10 cm. long or less.....3 *A. magniflora*
      4. Leaves over 10 cm. long.
        5. Fruit globose, 0.4 cm. or less in diam.; inflorescence racemose; leaves 15–20 cm. long.....4. *A. pilosa*
        5. Fruit elliptic, 2.5 cm. long, 1 cm. broad; inflorescence of numerous umbels; leaves up to 50 cm. long.....5. *A. obovata*
    3. Leaves never obovate.
      4. Largest leaves less than 10 cm. long.
        5. Fruit subtended by cupules 0.4–0.5 cm. long.....6. *A. cupularis*
        5. Fruit subtended by shallow disc nearly flat.

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[1] **Lindera Playfairii** (Hemsl.), comb. nov.

Litsea Playfairii Hemsl. Jour. Linn. Soc. Bot. **26**: 384. 1891.

Neolitsea Playfairii Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[3]: 66. 1925; Merr. Lingnan Sci. Jour. **5**: 81. 1927; Liou, Laurac. Chine Indoch. 145, pl. 1932.

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: *G. M. Playfair* (type, Kew; photo. & fragm., AA).

The original description gives "flowers 6-merous, perianth segments petaloid." Chun, when he made the combination under *Neolitsea*, stated that the flowers were in bud. Dissection shows the typical *Lindera* flowers. It is possible that under *Lindera* this same species has already been described and that only careful study of that genus will reveal it. No fruiting material is described for this species.

6. Leaves obtusish at apex, dull on upper surface (Japan & Formosa).....7. *A. lancifolia*
6. Leaves acutish at apex, more shining on upper surface, usually smaller than species (China).....7a. *A. lancifolia* var. *sinensis*
4. Largest leaves over 10 cm. long.
5. Inflorescence racemose; cupule densely pubescent.....8. *A. Henryi*
5. Inflorescence not racemose.
6. Leaves alternate.
7. Young branchlets and lower leaf-surface ferrugineous-tomentose.....9. *A. ferruginea*
7. Young branchlets, midrib and secondary nerves brown-pubescent; lower leaf-surface glaucous.....10. *A. litseaefolia*
6. Leaves verticillate or pseudoverticillate.
7. Leaves caudate-acuminate at apex; stamens exserted...11. *A. Tsaii*
7. Leaves never caudate-acuminate.
8. Fruit globose.
9. Leaves narrowly lanceolate, up to 50 cm. long.....12. *A. sesquipedalis*
9a. Leaves smaller, more pubescent.....12a. *A. sesquipedalis* var. *cambodiana*
9. Leaves not narrowly lanceolate, less than 30 cm. long.
10. Leaves broadly elliptic, dark, and shining above, pale below.....13. *A. perlucida*
10. Leaves not broadly elliptic.
11. Fruit not more than 1 cm. in diam., not apiculate.....14. *A. glaucina*
11. Fruit more than 1 cm. in diam., definitely apiculate.....15. *A. omeiensis*
8. Fruit not globose.
9. Fruit ovoid.
10. Leaves linear or oblong-lanceolate, shining above.....16. *A. setchuenensis*
10. Leaves elliptic-lanceolate, reticulate above.17. *A. reticulata*
10a. Leaves entirely glabrous.....17a. *A. reticulata* var. *glabra*
9. Fruit oblong or obovoid.
10. Numerous pairs of secondary veins, ascending, conspicuous on lower surface; lower surface of leaves light brown, pilose-pubescent, glaucous when young; fruit oblong.....17b. *A. reticulata* var. *Forrestii*
10. Secondary veins obscure; lower surface of leaves glaucous when young; fruit obovoid.....18. *A. Lecomtei*

1. **Actinodaphne confertiflora** Meissn. in DC. Prodr. **15**[1]: 219. 1864; Hook. f. Fl. Brit. Ind. **5**: 154. 1886.

Litsea shweliensis W. W. Sm. Notes Bot. Gard. Edinb. **13**: 167. 1921; Liou, Laurac. Chine Indoch. 171. 1932, **syn. nov.**

DISTRIBUTION: India and China.

INDIA. BHUTAN: *W. Griffith 2486* (type of *A. confertiflora* not seen, Kew); E. HIMALAYA: *W. Griffith 4333* (Kew, duplicate, Gray).

CHINA. YUNNAN: Shweli-Salween Divide. *G. Forrest 15705, 17531, 17648, 17697* (syntypes of *L. shweliensis*, Edinburgh; isotypes, AA).

This is a striking species because of its large ovate triplinerved leaves (15 × 10 cm.), glabrous, very shining and heavily reticulate above, and paler below.

In Hooker's 'Flora,' the specimen cited under *Actinodaphne confertiflora* is *Griffith* (Kew Distrib. *433*). This undoubtedly should be *4333*, the specimen cited above. Whether or not this is the number *2486* of Griffith, assigned to a different Kew Distribution number, cannot be ascertained without examination of the type in Hooker's Herbarium at Kew. The duplicate sheets of *Griffith No. 4333*, at Gray Herb. and N. Y., both are under the genus *Litsea*, the species being attributed also to Meissner. Since no trace of the publication of this combination has been found, it is presumably an herbarium name only. Therefore, it will not be mentioned in the present treatment. Examination of the specimens shows no reason for the species being considered a *Litsea*.

2. **Actinodaphne trichocarpa**, spec. nov.

Arbor ad 8 m. alta, ramulis teretibus brunneis adpresse pubescentibus, perulis ad basin ramulorum diu persistentibus. Folia in apice ramulorum verticillata, primo membranacea, demum satis coriacea, oblanceolata ad elliptica, 8–13 cm. longa, 2–3 cm. lata, varie acuminata, ad basin acuta vel subrotundata, supra sub lente minute reticulata, pallide viridia, glabra, subtus saepe glaucescentia, adpresse pubescentia glabrescentiave, margine undulata, penninervia, nervis 6–10 (vel pluribus) satis arcuatis, supra inconspicuis subtus satis prominentibus, petiolis 5–8 mm. longis, adpresse pubescentibus. Inflorescentia subumbellata, pauciflora, axillaris, solitaria, subsessilis; Flores ♂ & ♀ ignoti. Fructus globosus, 12–15 mm. latus, brunneus, adpresse tomentosus, disco plano, pedicello satis crasso.

DISTRIBUTION: western China.

CHINA. SZECHUAN: Mt. Omei, *F. T. Wang 23494* (type, AA); same locality

W. P. Fang 3100; Kuan-hsien, *W. P. Fang 1997.*—YUNNAN: Liang-shan, La'mi, *H. T. Tsai 51249.*

This species is unusual for the large pubescent fruit, which is characteristic of all of the specimens cited above. The *Wang* number is less glaucous on the lower leaf surface, and nearly glabrous. The Yunnan plant is also less glaucous, highly pubescent on the young leaves, and the leaves are somewhat larger and more elliptic than those of the Szechuan plants. However, due to the character of the fruit and the persistent bud-scales, these are all united under one species.

3. **Actinodaphne magniflora**, spec. nov.

Arbor 3 m. alta, ramulis teretibus striatis brunneis primo dense tomentosis demum adpresse ferrungineo-pubescentibus. Folia in apice ramulorum subverticillata, subcoriacea, oblanceolato-elliptica, 6–10 cm. longa, 2.5–4 cm. lata, abrupte acuminata, ad basin cuneata, supra sub lente minute reticulata, glabra, subtus ferrugineo-pubescentia, ad marginem leviter revoluta, penninervia, nervis flavis 8–10-jugis subarcuatis, supra immersis subtus prominulis, pubescentibus, petiolis 7–12 mm. longis tomentosis. Inflorescentia axillaris, ex subumbellis numerosis verticillatis confertis, composita, pedunculis 8–10 mm. longis, pubescentibus. Flores 3–5, circa 7 mm. longi, pedicello pubescente, 2–4 mm. longo, perianthii tubo brevissimo, lobis 6, ellipticis extus pubescentibus intus glabris. Flores ♂ staminibus 9, filamentis 5–7 mm. longis, ad basin pubescentibus, staminibus exterioribus 6, interioribus 3 biglandulosis, glandulis breviter stipitatis cordatis, staminodiis triangularibus stipitatis pubescentibus, ovario glabro, stylo filiformi, stigmate subdiscoideo. Flores ♀ fructusque ignoti.

DISTRIBUTION: China.

CHINA. KWANGTUNG: Hongkong, no collector given, *659* (as *Actinodaphne angustifolia).*—KWANGSI: Tou Ngok Shan, along Kwantung border, *W. T. Tsang 23203* (type, AA).

One of the large-flowered species of *Actinodaphne,* distinctive because of its large reddish brown pubescent flowers, borne in a terminal cluster; and because of its obovate, subverticillate leaves, pubescent on the lower surface. This has

been placed in *Actinodaphne* because of the fact that the scales are caducous at anthesis. The Hongkong specimen *No. 659* was labeled *A. angustifolia* Nees, but it differs materially from the latter in pubescence and in inflorescence.

4. **Actinodaphne pilosa** (Lour.) Merr. Trans. Am. Philos. Soc. n.s. **24**[2]: 165(Comm. Loureiro. Fl. Cochinch.). 1935.

Laurus pilosa Lour. Fl. Cochinch. 253. 1790; ed. 2. 311. 1793.
Machilus pilosa Nees, Syst. Laurin. 176. 1836.
Tetranthera pilosa Sprengel, Syst. **2**: 267. 1825.
Actinodaphne cochinchinensis Meissn. in DC. Prodr. **15**[1]: 216. 1864; Lecomte, Not. Syst. **2**: 330. 1913; Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 92. 1913; Fl. Gén. Indoch. **5**: 128, pl. 4. 1914; Merr. Lingnan Sci. Jour. **9**: 37. 1930; Liou, Laurac. Chine Indoch. 157. 1932.
Machilus hainanensis Merr. Philip. Jour. Sci. **21**: 342. 1922; Lingnan Sci. Jour. **5**: 80. 1927.

DISTRIBUTION: French Indo-China and China.

FRENCH INDO-CHINA. COCHINCHINA: *C. Gaudichaud 1839* (type of *A. cochinchinensis* not seen, Paris); *C. Gaudichaud 286* (cited in Lecomte's emended description, Paris).—ANNAM: *J. Loureiro* (type of *Laurus pilosa* not seen, Brit. Mus.†); *A. Chevalier 41230.*—TONKIN: *A. Petelot 759, 5966.*

CHINA. HAINAN: *F. A. McClure 7957* (type of *Machilus hainanensis*, NY); *7674* (paratype of same, NY; isotype, AA); *F. C. How 71736; C. Wang 34115, 35178, 35748, 36675; S. K. Lau 2930, 2962, 3516; N. K. Chun & C. L. Tso 43655, 44112, 44693; H. Fung 20058; W. T. Tsang 44935; H. Y. Liang 63828, 63829, 63225, 63140, 64081, 64476; S. P. Tang & H. Fung 19149; C. I. Lei 168, 344; F. A. McClure 19731, 19756.*—KWANGSI: *W. T. Tsang 21968; R. C. Ching 7772, 7765.*—YUNNAN: *A. Henry 13588.*

An unusual *Actinodaphne* characterized by large leaves up to 15 cm. or more long, obovate, acuminate, penninerved, shining above, glabrous and pilose below. The branchlets and inflorescence are also densely but closely pubescent. The inflorescence consists of a raceme about 3–4 cm. long; the fruit is globose and small, measuring less than 4 mm. in diam. It is a question whether or not this species so long included in the genus *Actinodaphne* should remain there. The inflorescence and fruiting specimens are certainly not typical of the usual conception of the genus.

5. **Actinodaphne obovata** Bl. Mus. Bot. Lugd.-Bat. **1**: 342. 1851; Meissn. in DC. Prodr. **15**[1]: 219. 1864; Liou, Laurac. Chine Indoch. 158. 1932.

Tetranthera obovata Hamilt. ex Wall. List No. 2562. 1830.
Tetradenia obovata Nees in Wall. Pl. As. Rar. **2**: 64. 1831.
Laurus obovata Hamilt. ex Nees in Wall. l.c.
Litsea obovata Nees, Syst. Laurin. 636. 1836.

DISTRIBUTION: India and China.

INDIA. SILHET: *N. Wallich 2562* (isotype of *Tetranthera obovata*, Kew, see footnote p. 370).

CHINA. YUNNAN: *H. T. Tsai 60884; C. Schneider 3902; G. Forrest 17821.*

This is one of the largest-leaved of the actinodaphnes known, the blade measuring sometimes 50 cm. in length and 25–30 cm. in width. The leaves are striking because of the rich warm-brown pubescence on the nerves, particularly on the under surface where they stand in relief against the extremely glaucous background. The inflorescence is composed of numerous pedunculate 2–3-flowered umbels. The fruit is black, elliptic, up to 2.5 cm. long and about 1 cm. broad, subtended by a flaring disc-like cupule 8–10 mm. long and 2–3 mm. in diameter. In 1911, Hayata[1] described *Litsea obovata* from Formosa. This name, although invalidated by the above publication of Nees, has been accepted in later floristic publications from Japan and Formosa. Makino & Nemoto[2] made the change to *Tetradenia.*

6. **Actinodaphne cupularis** (Hemsl.) Gamble in Sargent, Pl. Wilson. **2**: 75. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China, 1^5: 53. 1925.

Litsea cupularis Hemsl. Jour. Linn. Soc. Bot. **26**: 380. 1891.

DISTRIBUTION: western and central China.

CHINA. HUPEH: *A. Henry 3473, 3473B, 4382, 4584, 7711, 7750* (syntypes not seen, Kew); *A. Henry 3240, 3473A, 4370* (syntypes, Kew; isotypes, AA); *H. C. Chow 1489, 1543.*—SZECHUAN: *A. Henry 7122* (syntype not seen, Kew); *T. T. Yü 291; F. T. Wang 20683, 23644; W. P. Fang 1276, 1998, 5663, 5747.*—KWEICHOW: *A. N. Steward, C. Y. Chiao & H. C. Cheo 246; Y. Tsiang 6171.*

The leaves of this species are elliptic, acuminate, penninerved, glabrous above, somewhat glaucous and pubescent to glabrescent below. The fruit is ovoid, 12–14 mm. long, distinctly apiculate at the apex, and subtended by a deep more or less rugose cupule.

[1] Hayata, Jour. Coll. Sci. Tokyo, **30**: 252. 1911.
[2] Makino & Nemoto, Fl. Jap. ed 2. 375. 1931.

7. **Actinodaphne lancifolia** (Sieb. & Zucc.) Meissn. in DC. Prodr. 15[1]: 211. 1864; Franch. & Sav., Enum. Pl. Jap. 1: 413. 1875.

Daphnidium lancifolium Sieb. & Zucc. Abh. Akad. Wiss. Muench. 4[3]: 207 (Fam. Nat. Fl. Jap. 2: 83). 1846.

Iozoste lancifolia Bl. Mus. Bot. Lugd.-Bat. 1: 364. 1851.

Litsea lancifolia sensu Hemsl. Jour. Linn. Soc. Bot. 26: 382. 1891; Mats. & Hay. Enum. Pl. Formos. 352. 1906, non F.-Villar.

DISTRIBUTION: Japan and Foromsa.

JAPAN: (type of *Daphnidium lancifolium* not seen, Leiden).

This species has caused much discussion (see *Litsea rotundifolia* var. *oblongifolia* [Nees] Allen). It has rather small leaves 8–10 cm. long, more elliptic than lanceolate, subacuminate with obtuse acumen, penninerved, glabrous above, glabrescent below. The petioles are glabrescent, and the branchlets glabrescent to glabrous. The inflorescence consists of a solitary subumbel, subsessile. The pedicel is approximately 5 mm. long, topped by a shallow irregular disc with a spread of less than 4 mm. The fruit is subglobose, 6–7 mm. in diameter and apiculate. *Litsea lancifolia* (Roxb.) Benth. & Hook. f. ex. F.-Villar is a true *Litsea*, and has nothing to do with *Actinodaphne lancifolia* (Sieb. & Zucc.) Meissn. *Litsea lancifolia* F.-Vill. was based on the very different *Tetranthera lancifolia* Roxb., not on *Daphnidium (Iozoste) lancifolium* Sieb. & Zucc.

7a. **Actinodaphne lancifolia** (Sieb. & Zucc.) Meissn. var. **sinensis**, var. nov.

A typo differt foliis plerumque minoribus acutis coriaceis saepe glaucinis, fructu pedicellis plerumque brevioribus.

DISTRIBUTION: eastern and central China.

CHINA. CHEKIANG: *S. Chen 37, 439, 1165, 1258, 1414, 2156* (type, AA), *2415; W. C. Cheng 2146, 3607; R. C. Ching 5004, 5201; Y. Y. Ho 1317, 1627; Y. L. Keng 256.*—KIANGSU: *Y. L. Keng 2672, 2682.*—HUPEH: *H. C. Chow 1321.*

The leaves of the variety are, for the most part, smaller, more acute at the apex and more shining on the upper surface. In some cases, they are less obviously glaucous. In working over the material of *Litsea rotundifolia* var. *oblongifolia* (Nees) Allen, which was under *Actinodaphne* or *Litsea chinensis* in the herbarium, I found that a goodly portion was not

Litsea rotundifolia oblongifolia, but a species different in leaf shape, petiole length and infrutescence. It resembles *Actinodaphne lancifolia* (Sieb. & Zucc.) Meissn. from Japan, but differs slightly in leaf characters. The infrutescence is similar. Although the difference is slight, I propose the above new variety of the species, because of geographical separation. I have cited all of the specimens of the variety which I have seen, since they are for the most part recent collections which have been misidentified in various herbaria. It will be observed that the majority are from the province of Chekiang.

8. **Actinodaphne Henryi** Gamble, Kew Bull. 1913: 265; Liou, Laurac. Chine Indoch. 157. 1932.

DISTRIBUTION: known only from the two collections cited.

CHINA. YUNNAN: *A. Henry 11799A* (type, Kew; isotype, AA), *11799* (fruiting specimens cited in the additional description of fruit given by Liou, l.c.).

Actinodaphne Henryi is a distinctive species due to the extremely large lanceolate or elliptic penninerved leaves 25–30 cm. long, 6–7 cm. broad, and to the greyish-tan pubescent branchlets. The inflorescence is racemose and is covered completely with a dense golden-brown sericeous pubescence. The cupules are very distinctive in that they are covered with a fine greyish pubescence.

9. **Actinodaphne ferruginea** Liou, Laurac. Chine Indoch. 160. fig. 12. 1932.

DISTRIBUTION: known only from type locality.

FRENCH INDO-CHINA. ANNAM: *E. Poilane 1127* (type, Paris; photo., AA).

The above species is distinguished by alternate elliptic leaves 15 cm. or more long and up to 5 cm. broad, attenuately acuminate at apex and subrotund at the base, penninerved, glabrous shining above, and ferrugineous-tomentose below, particularly on the nerves. The young branchlets and petioles are at first covered with a close ferrugineous tomentum, but finally become glabrescent. "Ferrugineous" is hardly the term that should be used to express the shade of the pubescence on the specimen of the type which I have. It seems hardly red enough to be designated as such. Staminate flowers and fruit are unknown.

The species at first glance appears to be a *Litsea,* but the very definitely caducous bracts place it in *Actinodaphne.*

10. **Actinodaphne (?) litseaefolia,** spec. nov.

Frutex ad 4 m. alta, ramulis teretibus striatis rubescentibus ex adpresse pubescentibus glabris, initio griseis demum brunneis. Folia alterna, elliptica vel oblanceolato-elliptica, acuta vel subacuminata, ad basin attenuate acuta, utrinque sub lente reticulata, 13–18 cm. longa, 5.5–7.5 cm. lata, supra glabra, pallide viridia, nitida (fide collectoris), subtus glaucescentia, pubescentia, penninervia, nervis 10–12 satis arcuatis, supra planis subtus elevatis brunneis, petiolis 10–15 mm. longis, ex pubescentibus glabrescentibus. Inflorescentia multiflora, subumbellata, axillaris, solitaria, brevipedunculata. Flores ♂ immaturi, corollae lobis 6, ellipticis extus pubescentibus intus glabris, staminibus 9, 6 interioribus biglandulosis, filamentis ad basin parce pubescentibus; flores ♀ ignoti. Fructus parvus (immaturus?), oblongus, 5 mm. longus, 3 mm. latus, apiculatus, nigrescens, cupula adpresse pubescente 2 mm. longa 6 mm. lata, pedicello brevi crasso.

DISTRIBUTION: China (Hainan).
CHINA. HAINAN: *F. C. How 73626, 72705* (type, AA), *72550.*

A species that looks very like *Litsea Griffithiana* and *Litsea khasyana,* both from India, but has the ragged irregular cupule surrounding the fruit that is characteristic of *Actinodaphne.*

11. **Actinodaphne Tsaii** Hu, Bull. Fan Mem. Inst. Biol. **5**: 307. 1934: Hu in Hu & Chun, Ic. Pl. Sin. **4**: 9, pl. 159. 1935.

DISTRIBUTION: known only from type locality.
CHINA. YUNNAN: *H. T. Tsai 51907* (type, Fan Mem. Inst. Biol; isotype, AA).

A plant with slender branches and oblanceolate acuminate membranaceous leaves 10–12 cm. long, 2–3 cm. broad, penninerved at their apices. The species recalls *Actinodaphne sikkimensis* from India, but the veins of the latter are more numerous, and less conspicuous as well as less arcuate. Both plants have in common the long-exserted stamens of the ♂ flowers.

12. **Actinodaphne sesquipedalis** Hook. f. & Thoms. ex Meissn. in DC. Prodr. **15**[1]: 216. 1864; Hook. f. Fl. Brit. Ind. **5**: 151. 1886; Gamble, Jour. As. Soc. Bengal, **75**[2]: 113. 1912; Liou, Laurac. Chine Indoch. 158. 1932.

DISTRIBUTION: India and Indo-China?
INDIA. MERGUI: *W. Griffith* (type, Kew).

Except for the type of *Actinodaphne sesquipedalis*, I have seen no material of the species. Liou has recorded one specimen from Annam. It is an interesting plant, having coarse, long narrowly lanceolate, pubescent, penninerved leaves, verticillate, over 50 cm. long and 10 cm. broad. The inflorescence consists of numerous pedunculate umbels, which increase tremendously in size and coarseness in the fruiting stage. The fruit is globose.

12a. **Actinodaphne sesquipedalis** var. **cambodiana** Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 93. 1913; Fl. Gén. Indoch. **5**: 130. 1914.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. CAMBODIA: *L. Pierre 627* (type, Paris).

The leaves of the variety are smaller and more pubescent than those of the species.

13. **Actinodaphne perlucida**, spec. nov.

Arbor 10 m. alta, ramulis teretibus pallide brunneis dense cano-tomentosis mox glabris lucidis. Folia in apice ramulorum verticillata, crasse coriacea, elliptica, abrupte acuta vel obtusa, 11–21 cm. longa, 4–9 cm. lata, primo tomentosa ut videtur, demum nonnisi ad marginem glabrescentia, sicca, supra nitida, sub lente minute reticulata, pubescentia praecipue in nervis, subtus obscure pallida, glabrescentia, penninervia, nervis 7–9-jugis erecto-arcuatis, supra planis subtus prominulis, plerumque nitidis, petiolis crassis, 1–2 cm. longis, 2–3 cm. latis, primo tomentosis mox glabris. Inflorescentia subumbellata, pauciflora, axillaris, solitaria, sessilis. Flores ♂ & ♀ ignoti. Fructus subglobosus, apiculatus, 6–7 mm. in diametro, nigrescens, glaber, cupula brevi irregulariter dentata pubescente, pedicello brevissimo incrassato.

Distribution: French Indo-China.

French Indo-China. Annam: *E. Poilane 4590* (type, Paris; photo. and fragm., AA).

An extremely unusual species, placed rather hesitatingly in the genus *Actinodaphne*, because of the character of the cupule. Again, the species is based on fruiting material only, because it is so very distinct. The proper disposition of it cannot be ascertained until staminate specimens are collected. The large penninerved leaves, very darkly shining above and pale below, at once set the species apart. It is evident from the mature specimen that in an early stage the leaves were covered with a dense light tomentum for traces of it are still apparent, particularly on the leaf margins.

14. **Actinodaphne glaucina**, spec. nov.

Arbor ad 10 m. alta, ramulis teretibus striatis ferrugineis adpresse pubescentibus mox glabris, foliorum cicatricibus rotundis haud elevatis. Folia in apice ramulorum subverticillata, ex glabrescentibus glabra, an primo pubescentia, subcoriacea, longe lanceolata, 13–23 (28) cm. longa, 2.5–4 (8) cm. lata, ad apicem acuta vel subacuminata, ad basin attenuate acuta, sub lente supra minute reticulata, subtus ex pallide glaucescentia, penninervia, nervis plerumque 10-jugis subascendentibus flavis, supra conspicuis planis glabrescentibus subtus prominulis ex pubescentibus glabris, petiolis 12–20 mm. longis, ferrugineo-tomentosis. Inflorescentia subumbellata, axillaris, solitaria, pedunculata, pedunculis 2–6 mm. longis, adpresse pubescentibus. Flores ♂ et ♀ ignoti. Fructus globosus, 7–10 mm. latus, nigrescens, disco planiusculo adpresse pubescente, pedicello adpresse pubescente incrassato.

Distribution: China (Hainan).

China. Hainan: Fan Yah, *N. K. Chun & C. L. Tso 44045* (type, AA); *F. C. How 72720* (sterile specimen).

As is frequently the case, the young sterile shoot has larger, coarser leaves, but their type, as well as the characteristic leaf scars, place it with this species. The nearest affinity is *Actinodaphne Henryi* Gamble. Again, more material may show this not to be an *Actinodaphne* but a *Litsea* or a *Neolitsea*. In the

dried state this plant is easily distinguished by contrasting color of the leaf surfaces, the upper being a soft brown, the lower pale green and glaucescent.

15. **Actinodaphne omeiensis** (Liou), spec. nov.

Actinodaphne reticulata Meissn. var. *omeiensis* Liou, Laurac. Chine Indoch. 158. 1932.

DISTRIBUTION: China (Szechuan).

CHINA. SZECHUAN: *W. P. Fang 2443, 2386* (syntypes of *A. reticulata* var. *omeiensis*, Paris; isotypes, AA); *Y. Chen 7206* (syntype of *A. reticulata* var. *omeiensis* not seen, Paris); *F. T. Wang 23212, 23585d; T. T. Yü 402; W. P. Fang 3210.*

This has been raised to specific rank because of the fact that, aside from the leaf shape and its position on the stem, it has no resemblance to *A. reticulata* Meissn. The leaves are coarser, somewhat larger and entirely glabrous, with fewer veins arising from the midrib, salient below. The stem at maturity is maroon in color and glabrous. The fruiting inflorescence is composed of several umbels, consisting of subspherical black fruit about 15 mm. in diameter, very definitely apiculate, subtended by a shallow disc-like cupule, undulate in margin, less than 2 mm. deep, borne on a slender slightly enlarged pedicel, both cupule and pedicel being appressed-pubescent.

16. **Actinodaphne setchuenensis** (Gamble), comb. nov.

Lindera setchuenensis Gamble in Sargent, Pl. Wilson: **2**: 82. 1914; Liou, Laurac. Chine Indoch. 128. 1932.

Benzoin setchuenense Rehd. Jour. Arnold Arb. **1**: 145. 1919; Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 47. 1925.

DISTRIBUTION: China (Szechuan).

CHINA. SZECHUAN: *E. H. Wilson 4586* (type, AA).

This species was described from a pistillate specimen only. Examination of the type collection shows that the fruit is subtended by a shallow cupule which very distinctly has the remains of the corolla and staminodes about its margin. The leaves are pseudoverticillate, linear-oblong, up to 20 cm. long, about 2.5 cm. broad, penninerved, shining above and pubescent below. The inflorescence consists of pedunculate umbels. The fruit is ovoid, 1 cm. long, subtended by a small irregular shallow cupule about 5 mm. long, borne on a very slender pedicel.

17. **Actinodaphne reticulata** Meissn. in DC. Prodr. 15[1]: 212. 1864; Hook. f. Fl. Brit. Ind. 5: 147. 1886; Chun, Contr. Biol. Lab. Sci. Soc. China 1[5]: 53. 1925; Liou, Laurac. Chine Indoch. 158. 1932.

DISTRIBUTION: India and China?
INDIA. NEPAL: *Herb. Hooker f.* (type, Kew).

Although *Actinodaphne reticulata* Meissn. has been reported from China, the species proper in all probability does not occur there. It is characterized by pubescent verticillate leaves and branchlets. The leaves are very conspicuously reticulate, glabrous above, pubescent below, elliptic (oblong), penninerved and long-acuminate. The fruit is ovoid 10–12 mm. long, 7–8 mm. broad, subtended by a thin shallow cupule, and borne on a slender pedicel.

17a. **Actinodaphne reticulata** Meissn. var. **glabra** Meissn. in DC. Prodr. 15[1]: 213. 1864; Liou, Laurac. Chine Indoch. 158. 1932.

DISTRIBUTION: India and China.
INDIA. NEPAL?: *Herb. Hooker f.* (type not seen, Kew).

Liou lists this variety as occurring in Yunnan. Hooker f. in the 'Flora of British India' mentions the type of the variety as being a more mature specimen than the type of the species, hence more glabrous. I have seen no representative of the variety except the specimen from Khasya in the Hooker Herbarium, with a fruiting branch nearly as pubescent as the sterile shoot on the sheet beside it. The latter, however, has the remnants of long dark hairs on the under surface of the leaves in addition to the finer lighter pubescence. Although pubescence is at best a variable character and a weak one on which to base a variety, nevertheless, until more material is at hand, the variety will be retained.

17b. **Actinodaphne reticulata** Meissn. var. **Forrestii**, var. nov.

A typo manifeste differt foliis arcte elliptico-lanceolatis, subtus glaucescentibus nervis primo intuito adscendentibus nec arcuatis; indumento pilis adpressis longioribus; cupulis majoribus; pedicellis longioribus; perulis pubescentibus.

DISTRIBUTION: China (Yunnan).

CHINA. YUNNAN: *G. Forrest 18827* ♂ (type, AA), *16047, 17555, 9069; A. Henry 11436, 13523.*

A variety as yet known only from Yunnan, which shows its affinity for *A. reticulata,* but differs in having narrower, longer leaves, glaucous below and covered with light brown pilose pubescence in the young stages. Both characters may or may not persist through the fruiting stage. The branchlets and petioles are covered with a short-appressed dense pubescence, becoming glabrescent in the fruiting stage. The fruiting inflorescence of the variety is larger than that of the species. The fruit is oblong, apiculate, 14–16 mm. long and 6–8 mm. wide, subtended by a cupule 8–10 mm. deep, and borne on a pedicel 15 mm. long.

The variety is named for the late Mr. George Forrest, who collected extensively for a number of years in western China and Tibet.

18. **Actinodaphne Lecomtei,** spec. nov.

Litsea hupehana var. *longifolia* Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 88. 1913; Liou, Laurac. Chine Indoch. 179. 1932.

Actinodaphne reticulata sensu Gamble, in Sargent, Pl. Wilson. 2: 75. 1914, non Meissn.

Arbor ad 10 m. alta, ramulis teretibus pubescentibus mox glabris. Folia subverticillata vel alternata, membranacea, lanceolata, 10–15 cm. longa, 14–26 mm. lata, acuta vel attenuate acuta, supra opaca, glabra, sub lente minute reticulata, subtus interdum glaucescentia, parce adpresseque pubescentia, sub lente minute reticulata, penninervia, costa valde prominente pallidiore, nervis numerosis supra subtusque inconspicuis, petiolis gracilibus, 7–13 mm. longis, ex adpresse pubescentibus glabris. Inflorescentia subumbellata, axillaris, subsessilis. Flores numerosi, circa 7 mm. longi, pedicello pubescente, 2–3 mm. longo, perianthii tubo brevi, lobis (4)–6, ellipticis laceratis extus pubescentibus subtus glabris. Flores ♂ staminibus 9 (vel pluribus), filamentis gracilibus; staminibus exterioribus 6, 6 mm. longis, interioribus 3.5 mm. longis biglandulosis, glandulis filamentis triplo minoribus breviter stipitatis, ad tertium inferum tubi adnatis; ovario rudimentali.

Flores ♀ ignoti. Fructus obovoideus, circa 7 mm. longus, 5 mm. latus, glaber, viridi-nigrescens, cupula 5 mm. longa, crenulata glabra rugulosa, pedicello 7–8 mm. longo, subincrassato.

DISTRIBUTION: western China.

CHINA. SZECHUAN: Mt. Omei, *E. H. Wilson* (Veitch Exped.) *4424* (type of *Litsea hupehana longifolia* Lecomte, Kew; isotype, AA); *E. H. Wilson* (Veitch Exped.) *5777*; *C. Wang 23250, 23658*; *P. Farges 1474*.—KWEICHOW: *W. Y. Chun 7052*.

DOUBTFUL SPECIES

Actinodaphne Hookeri Meissn. in DC. Prodr. 15[1]: 218. 1864; Hook. f. Fl. Brit. Ind. 5: 149. 1886.

DISTRIBUTION: India and China?

INDIA: *Herb. Hooker f.* (type not seen, Kew).

CHINA. YUNNAN: *H. T. Tsai 61952?*

The Yunnan specimen fits the description in the larger sense. It is possible that the Yunnan material represents a variety of the species, and that *A. Hookeri* Meissn. is confined to India.

Actinodaphne pedunculata (Bl.) Meissn. in DC. Prodr. 15[1]: 211. 1864; Hemsl. Jour. Linn. Soc. Bot. 26: 383. 1891.

Iozoste pedunculata Bl. Mus. Bot. Lugd.-Bat. 1: 364. 1851.

CHINA: Blume (type of *Iozoste pedunculata* not seen, Leiden; photo., AA).

This species, to judge from the photograph, appears to be a *Machilus*. The species is difficult to determine without the actual material, but if it is *Machilus* it certainly belongs in the group with *Machilus velutina* Champ. and *M. Grijsii* Hance. Superficially it resembles *Actinodaphne magniflora* Allen.

EXCLUDED SPECIES AND VARIETIES

Actinodaphne chinensis Nees, Syst. Laurin. 600. 1836 = **Litsea rotundifolia** Hemsl. var. **oblongifolia** (Nees) Allen.

Actinodaphne chinensis Nees var. *oblongifolia* Nees, Syst. Laurin. 600. 1836 = **Litsea rotundifolia** Hemsl. var. **oblongifolia** (Nees) Allen.

Actinodaphne chinensis Nees var. *rotundifolia* Nees, Syst. Laurin. 600. 1836 = **Litsea rotundifolia** Hemsl.

Actinodaphne confertifolia (Hemsl.) Gamble in Sargent, Pl. Wilson. 2: 74. 1914 = **Neolitsea confertifolia** (Hemsl.) Merr.

Actinodaphne hongkongensis Chun, Jour. Arnold Arb. 8: 22. 1927 = **Neolitsea hongkongensis** (Chun) Allen.

Actinodaphne rotundifolia Merr. Lingnan Sci. Jour. 15: 119. 1936 = **Litsea rotundifolia** Hemsl.

KEY TO THE SPECIES OF NEOLITSEA

1. Leaves penninerved.
  2. Leaf margins undulate; leaves narrowly lanceolate.
    3. Fruit subtended by a scarcely enlarged disc 2 mm. long; pedicel 4 mm. long; largest leaves up to 12 cm. long.....1. *N. confertifolia*
    3. Fruit subtended by a shallow cupule 3 mm. deep, 5–6 mm. in diam.; pedicel 7–8 mm. long; largest leaves up to 9 cm. long.....2. *N. undulatifolia*
  2. Leaf margins not undulate.
    3. Young branchlets and leaves ferrugineous-tomentose.
      4. Pubescence of leaf only on petiole and half-way up midrib; leaf oblong, never more than 2.3 cm. broad.....3. *N. oblongifolia*
      4. Pubescence of leaf covering entire surface; leaf obovate, obovate-elliptic, never less than 3 cm. broad.....4. *N. cambodiana*
        4a. Leaves glabrous, attenuate at base and apex, reticulate.....4a. *N. cambodiana* var. *glabra*
    3. Young branchlets and leaves not ferrugineous-tomentose.
      4. Fruit ovoid; leaves subacuminate with obtuse acumen (Hongkong).....5. *N. hongkongensis*
      4. Fruit globose; leaves long-acute (Szechuan).....6. *N. wushanica*
1. Leaves triplinerved or obscurely triplinerved.
  2. Leaves obscurely triplinerved.
    3. Leaves caudate, pale; flowers borne in densely crowded subumbels.....7. *N. homilantha*
    3. Leaves not caudate; flowers borne in more loosely arranged subumbels.
      4. Leaves glabrous, very coriaceous, extremely obtuse.....8. *N. obtusifolia*
      4. Leaves brown-tomentose below, subcoriaceous, subacuminate with obtuse acumen.....9. *N. elaeocarpa*
  2. Leaves definitely triplinerved.
    3. Leaves covered below with dense golden or silvery sericeous pubescence.
      4. Leaves ovate-elliptic, obtuse to acute.....10. *N. Sieboldii*
      4. Leaves oblong-lanceolate, falcate-acuminate (Japan & eastern China).....11. *N. aurata*
        4a. Leaves glabrescent, pubescence colorless (western China).....11a. *N. aurata* var. *glabrescens*
    3. Leaves not covered below with dense golden or silvery sericeous pubescence.
      4. Largest leaves never less than 15 cm. long.
        5. Fruit spherical.
          6. Fruit 10 mm. in diam.; leaves oblong-lanceolate....12. *N. chinensis*
          6. Fruit 15–18 mm. in diam.; leaves ovate.....13. *N. kwangsiensis*
        5. Fruit ellipsoid.
          6. Inflorescence composed of peduncled subumbels; fruit subtended by the very slightly enlarged pedicel tip.....14. *N. Levinei*
          6. Inflorescence composed of sessile subumbels; fruit subtended by shallow cupule 2–3 mm. long, 7–8 mm. in diam.....15. *N. Howii*
      4. Largest leaves not more than 13 cm. (occasionally 15 cm. in *N. Chuii*) long.

5. Lower leaf-surface grey-glaucous; veins, petioles and young branchlets ferrugineous tomentose.....16. *N. alongensis*
5. Lower leaf-surface often somewhat glaucous; veins, petioles and young branchlets not ferrugineous-tomentose.
6. Fruit spherical or subspherical.
7. Ovary pubescent.....17. *N. Poilanei*
7. Ovary glabrous.
8. Leaves ovate to elliptic, obtuse, prominently reticulate; bark aromatic .....18. *N. Merrilliana*
8. Leaves not ovate to elliptic, nor obtuse, not prominently reticulate; bark not aromatic.
9. Fruiting pedicel 6–8 mm. long, surrounded by disc 3–4 mm. in diam.....19. *N. umbrosa*
9. Fruiting pedicel shorter than 6–8 mm.; disc very small.
10. Lowest pairs of nerves outstanding on lower surface, 2–3 pairs near tip of leaf almost imperceptible.
11. Branchlets and petioles pubescent.....20. *N. pulchella*
11. Branchlets and petioles glabrous.....
.....25a. *N. phanerophlebia* f. *glabra*
10. Lowest pairs of nerves hardly more prominent than others.....21. *N. zeylanica*
10a. Leaves more caudate.....21a. *N. zeylanica* var. *Fangii*
6. Fruit elliptic.
7. Ovary pubescent.....17. *N. Poilanei*
7. Ovary glabrous.
8. Fruit not less than 15 mm. long; pedicels enlarged to nearly the diameter of the branchlets.....22. *N. ellipsoidea*
8. Fruit not more than 8 mm. long; pedicels scarcely enlarged.
9. Branchlets subverticillate.....23. *N. polycarpa*
9. Branchlets not subverticillate.
10. Branchlets and leaves entirely glabrous except for petioles.
11. Largest leaves not less than 10 cm. long; petioles 20–30 mm. long.....24. *N. Chuii*
11. Largest leaves not more than 9 cm. long; petioles not more than 15 mm. long.....
.....24a. *N. Chuii* f. *annamensis*
10. Branchlets, leaves and petioles pubescent.....
.....25. *N. phanerophlebia*

1. **Neolitsea confertifolia** (Hemsl.) Merr. Lingnan Sci. Jour. 15: 419. 1936.

Actinodaphne confertifolia (Hemsl.) Gamble in Sargent, Pl. Wilson. 2: 74. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[5]: 54. 1925; Liou, Laurac. Chine Indoch. 159. 1932.

Litsea confertifolia Hemsl. Jour. Linn. Soc. Bot. 26: 379, pl. 7. 1891.

DISTRIBUTION: China.

CHINA. HUPEH: *A. Henry 3054, 6007, 7829, 7829A* (syntypes, Kew; isotypes, Gray), *1247, 2202, 2203* (syntypes not seen, Kew); *C. Silvestri 749, 751.*—KWANGTUNG: *C. L. Tso 21140, 20917.*—SZECHUAN: *A. Henry 7197* (syntype, Kew; isotype, Gray).

Most of the specimens of the above species are from central or western China. It is a distinctive species because of the undulate margins of the leaves; the latter are narrow lanceolate, less than 10 cm. long and 2 cm. broad, somewhat similar in appearance to *Neolitsea undulatifolia* (Lévl.) Allen. *Neolitsea confertifolia,* however, has larger, coarser leaves, which are glaucous below. The venation in the two species also differs.

2. **Neolitsea undulatifolia** (Lévl.) Allen, Jour. Arnold Arb. 17: 328. 1936.

Litsea undulatifolia Lévl. Fl. Kouy-Tchéou, 220. 1914.
Neolitsea spec. Rehd. Jour. Arnold Arb. 10: 193. 1929.

DISTRIBUTION: western China.

CHINA. KWEICHOW: *J. Cavalerie without number,* March 14, 1900 (holotype of *Litsea undulatifolia,* Edinb.; isotype, AA).—YUNNAN: *H. T. Tsai 62499.*

The leaves of the species are verticillate, small (less than 9 cm. long), narrowly elliptic with an undulate margin, pennineryed, the midrib very prominent, with numerous pairs of more inconspicuous laterals.

The Tsai specimen recalls in its leaf characters *Neolitsea confertifolia* (Hemsl.) Merr. except for the fact that in the latter the leaves are glaucous beneath. The fruiting inflorescence of *N. undulatifolia* consists of sessile umbels. An individual fruit is borne on an enlarged pubescent pedicel which flares into a shallow, more or less crenulate, somewhat pubescent cupule. The fruit is ovoid-ellipsoid, black, approximately 12×8 mm., apiculate, rugose on drying. The young branchlets are appressed-pubescent.

3. **Neolitsea oblongifolia** Merr. & Chun, Sunyatsenia, 2: 234, pl. 45. 1935.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: *N. K. Chun & C. L. Tso 44049* (type, NY; isotype, AA), *44337, 43891; F. C. How 73215; H. Y. Liang 63523, 63145, 62798; C. Wang 34698.*

A species easily recognized by its small, slender, pale green, oblong or oblong-lanceolate leaves, less than 10 cm. long and 2 cm. broad.

4. **Neolitsea cambodiana** Lecomte, Not. Syst. 2: 335. 1913; Fl. Gén. Indoch. 5: 143. 1914; Liou, Laurac. Chine Indoch. 143. 1932.

Neolitsea ferruginea Merr. Lingnan Sci. Jour. 7: 305. 1929.

DISTRIBUTION: French Indo-China and China.

FRENCH INDO-CHINA. CAMBODIA: *L. Pierre 5154* (type of *Neolitsea cambodiana*, Paris).

CHINA. KWANGTUNG: *W. Y. Chun 5560* (type of *Neolitsea ferruginea*, NY; isotype, AA); *S. K. Lau 20338; C. L. Tso 21039; W. T. Tsang & K. C. Wong 14480, 14591.*—KIANGSI: *S. K. Lau 4457, 4818.*

The species is delimited by the dense ferrugineous tomentum on the young leaves and branchlets. This tomentum gradually disappears from the leaves with age, the under surface of the leaf blade showing glaucous, the veins being the last to lose their pubescence. There is a great deal of variation in the leaf characters of the species. *Chun 5552,* cited by Merrill in his original publication, has leaves which are more obovate than oblong-elliptic or lanceolate. In the specimen from Cambodia, they are lanceolate and more glaucous than in the Chinese material. In spite of this variation, however, there can be no doubt that these are conspecific.

4a. **Neolitsea cambodiana** Lecomte var. **glabra**, var. nov.

A typo differt ramulis adpresse pubescentibus, foliis magis attenuatis ad basin et in apice glabris concoloribus utrinque reticulatis, petiolis adpresse pubescentibus.

DISTRIBUTION: known only from type locality.

CHINA. KWANGTUNG: *W. T. Tsang 21646* (type, AA).

The salient difference between the variety and the species is found in the leaves; they are more attenuate at the base and apex; are concolorous, glabrous and everywhere reticulate.

5. **Neolitsea hongkongensis** (Chun), comb. nov.

Actinodaphne hongkongensis Chun, Jour. Arnold Arb. 8: 22. 1927; Contr. Biol. Lab. Sci. Soc. China, 1[3]: 54. 1925; Liou, Laurac. Chine Indoch. 160. 1932.

Actinodaphne angustifolia sensu Benth. Fl. Hongkong. 293. 1861, non Nees.

DISTRIBUTION: China (Kwangtung).

CHINA. KWANGTUNG: Hongkong, *C. Wilford?* (type of *Actinodaphne angustifolia* sensu Benth., non Nees, Kew; isotype, Gray!); *Herb. Hongkong 4633* (AA).

The species stands out on account of the oblong-lanceolate to elliptic leaves, heavily and coarsely reticulate (not subfoveolate) above and below, brown, glabrous above and very pale brown-pubescent below. The specimen from Gray, cited as possibly the isotype of *Actinodaphne angustifolia* of Bentham, is in fruit. It differs from *Actinodaphne angustifolia* of Nees in its smaller, oblong-lanceolate leaves not glaucous below, and the flat disc subtending the fruit. However, *Hongkong No. 4633,* which matches Wilford's specimen as to leaf structure and other characters, is a ♂ branch with the typical *Neolitsea* flower structure.

6. **Neolitsea wushanica** (Chun) Merr. Sunyatsenia, 3: 250. 1937.

Litsea wushanica Chun, Jour. Arnold Arb. 9: 153. 1928.

Litsea gracilipes Hemsl. Jour. Linn. Soc. Bot. 26: 381. 1891, non Hook. f.; Chun, Contr. Biol. Lab. Sci. Soc. China, 1[8]: 65. 1925.

Neolitsea gracilipes Liou, Laurac. Chine Indoch. 143, pl. 1932, syn. nov.

DISTRIBUTION: China.

CHINA. SZECHUAN: *A. Henry 7113, 7114* (syntypes, Kew; isotypes, Gray).—HUPEH: *A. Henry 2999* (syntype not seen, Kew).

The leaves of this species are 7 cm. or less in length and up to 2.5 cm. broad, elliptic, acute or subacuminate, very pointed at the apex, more or less acuminate at the base, penninerved, dull pale green above and glaucous below. The globose fruit (6–7 mm. in diam.) is borne on the branches in a subumbellate cluster, subtended by a shallow cupule and pedicel somewhat enlarged, their combined lengths nearly 1 cm. The latter gradually distends toward its apex so that the line of demarcation where it joins the cupule is scarcely perceptible.

7. **Neolitsea homilantha,** spec. nov.

Arbor vel frutex, . . . m. alta, glaber, ramulis teretibus striatis brunneis glabris, perulis brunneo-sericeis. Folia in apice ramulorum, subcoriacea, elliptica, 7–10 cm. longa, 2.5–4 cm. lata, subcaudata, ad basin acuta vel subrotundata, glabra, supra minute obscureque reticulata sub lente, pallide viridia,

subtus glauca, margine undulata, penninervia, triplinervia, nervis 4–6-jugis, nervis in jugo infimo oppositis, ad 1 cm. supra laminae basim confluentibus, reliquis subalternatis ad apicem laminae confertioribus flavis supra subtusque planis, petiolis 10–14 mm. longis, glabris rugosis. Inflorescentia subumbellata, conferta, multiflora, axillaris, subsessilis. Flores ♂ pedicello pubescente, 2 mm. longo, corolla 3–4 mm. longa, tubo brevissimo, lobis 4, ovatis extus pubescentibus intus glabris, staminibus 6, antheris magnis, filamentis leviter exsertis ad basin subpubescentibus, 2 interioribus bi-glandulosis, glandulis breviter stipitatis ad basin filamenti adnati. Flores ♀ minores, staminodiis, ovario ovoideo glabrescente, stylo brevi, stigmate sub lente papillis filiformibus instructo. Fructus ignotus.

Distribution: China (Yunnan).
China. yunnan: *G. Forrest 9524* (type, AA), *9540*.

An unusual feature is presented by the horizontal linear scars appearing on the new growth, which extend half-way the circumference of the twig. They occur between the bud-scale scars and the first leaves. Very possibly they are left by the leaves which are fugacious at an early age. The more logical interpretation, however, is that they represent scars left by bud-scales that are persistent during the elongation of the axis, since there seems to be no trace of the buds which are usually found in the axils of leaves.

8. **Neolitsea obtusifolia** Merr. Lingnan Sci. Jour. **14**: 6. 1935.

Distribution: China (Hainan).
China. hainan: *S. K. Lau 607* (type, NY; isotype, AA), *1316; C. Wang 34041, 34181, 34935, 36192; H. Y. Liang 63517, 66489*.

The distinctive feature of this species is the very stiff leathery appearance given by the oblong-oblanceolate or narrowly oblong-ovate leaves. This is a species similar to *N. elaeocarpa* from Indo-China, but with smaller and coarser leaves, which are smoother in texture and more obtuse. The pedicels in the fruiting stage are longer also.

9. **Neolitsea elaeocarpa** Liou, Laurac. Chine Indoch. 144. 1932.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. ANNAM: *E. Poilane 10980, 1151,* fruiting specimen (syntypes, Paris), *7126* (syntype, Paris; photo. and fragm., AA).

A species which has in common with *Neolitsea obtusifolia,* a semi-triplinerved condition and similar fruiting inflorescences. The young branchlets and the under surface of the leaves of *Neolitsea elaeocarpa* are brown-tomentose, the pubescence persisting on the veins past anthesis, and becoming glabrescent to glabrous at maturity. There is a resemblance between this species and the Indian variety *concolor* of *Litsea zeylanica,* which belongs under *Neolitsea.* The latter differs, however, in being glabrous throughout, and having longer and enlarged funnel-shaped pedicels ending in a flaring disc which supports the somewhat larger fruit. In spite of these differences there is a strong affinity between the two entities.

10. **Neolitsea Sieboldii** (O. Ktze.) Nakai, Bot. Mag. Tokyo, **41**: 520. 1927.

Litsea glauca Siebold, Verh. Bat. Genoot. **12**: 24. 1830, excl. synon.
Malapoenna Sieboldii O. Ktze. Rev. Gen. **2**: 572. 1891.
Tetradenia glauca (Sieb.) Matsumura, Ind. Pl. Jap. **2²**: 140. 1912; Makino & Nemoto, Fl. Jap. 933. 1925; ed. 2. 374. 1931.
Neolitsea glauca (Sieb.) Koidz. Bot. Mag. Tokyo, **32**: 257. 1918, excl. synon.
Laurus glauca Liou, Laurac. Chine Indoch. 148. 1932, excl. synon.
For complete synonymy see Nakai, l. c.

DISTRIBUTION: Japan, Formosa, Korea and eastern China.

JAPAN: *Siebold* (type of *Litsea glauca,* Leiden?; isotype, Gray).

Nakai's new name was necessary, since *Laurus glauca* of Thunberg, the specimen on which the name was based, is a *Symplocos. Neolitsea Sieboldii* is a beautiful species with leaves varying in shape from ovate-obtuse to acute, the under surface covered with closely appressed silky pubescence, silvery tawny or orange-brown. In these respects it resembles *Neolitsea aurata* (Hay.) Merr., the latter, however, having oblong-lanceolate acuminate leaves. *Laurus glauca* as then interpreted by Siebold must be considered the type of Siebold's

species. The material I have seen of the species exclusive of China seems to contain a mixture. A more complete study of the Japanese flora is necessary before it can be said definitely what other elements are included. The specimens from China are uniform, however, and match Siebold's type.

11. **Neolitsea aurata** (Hay.) Merr. Lingnaam Agr. Rev. **4**: 124. 1927.

Litsea aurata Hay. Jour. Coll. Sci. Tokyo, **30**: 246 (Mater. Fl. Formosa). 1911.
Tetradenia aurata Hay. Ic. Pl. Formos. **3**: 167. 1913; **5**: 174, fig. 61c & c'. 1915.

DISTRIBUTION: Formosa and China.
FORMOSA. *K. Miyake*, in Nov. 1899; *G. Nakahara 1045* (syntypes not seen, Taihoku?).
CHINA. KWANGTUNG: *To & Te'ang 12519; S. K. Lau 2744; S. S. Sin 11513.*—CHEKIANG: *R. C. Ching 2500.*

The species is characterized by the triplinerved oblong-lanceolate leaves, falcate-acuminate, densely reddish or golden brown-pubescent on the lower surface. Merrill has made this combination from a named specimen from Formosa. Undoubtedly, *Litsea aurata* is a *Neolitsea*. However, *No. 12519*, which Merrill cites as the Chinese representative, does not entirely agree with Hayata's description, the inflorescence not being typical, and the leaf-tips being definitely acuminate, falcate and smaller.

11a. **Neolitsea aurata** (Hay.) Merr. var. **glabrescens** Liou, Laurac. Chine Indoch. 149. 1932.

DISTRIBUTION: western China.
CHINA. SZECHUAN: *W. P. Fang 1315, 5640* (syntypes, Paris; isotypes, AA).

The variety shows a close relation to the species, differing only in the glabrescent branchlets and the slightly less pubescent under surface of the leaves. The color of the pubescence is less aureous and more tawny.

12. **Neolitsea chinensis** Chun, Contr. Biol. Lab. Sci. Soc. China, **1**[5]: 68. 1925; Liou, Laurac. Chine Indoch. 149. 1932.

Neolitsea lanuginosa Gamble var. *chinensis* Gamble in Sargent, Pl. Wilson. **2**: 79. 1914.

DISTRIBUTION: western China.

CHINA. SZECHUAN: *E. H. Wilson 3707* (type, AA); *Veitch Exped. 2266* (syntype not seen, Kew).

This species with large (up to 20 cm.) leaves, triplinerved, oblong-lanceolate, and coriaceous, is very similar to *N. Levinei* Merr. but is easily distinguished by its globose fruit.

13. **Neolitsea kwangsiensis** Liou, Laurac. Chine Indoch. 146. 1932.

DISTRIBUTION: known only from type locality.

CHINA. KWANGSI: *R. C. Ching 7043, 7017* (syntypes, NY).

A striking species on account of the large, ovate or obovate-oblong, glabrous leaves up to 20 cm. long and 10 cm. broad, triplinerved, with conspicuous parallel transverse veins. The long petioles (up to 4 cm.) also add an unusual feature, as well as the large spherical fruit (1.5–1.8 cm. in diam.).

14. **Neolitsea Levinei** Merr. Philip. Jour. Sci. Bot. **13**: 138. 1918; Groff, Lingnan Univ. Sci. Bull. No. **2**: 48. 1930.

Benzoin Levinei (Merr.) Chun ex Liou, Laurac. Chine Indoch. 148. 1932, pro synon.

DISTRIBUTION: China (Kwangtung and Kiangsi).

CHINA. KWANGTUNG: *E. D. Merrill 11071* (type not seen, Herb. Manila); *C. O. Levine 1332* (syntype, Herb. Manila, isotype, AA); *W. T. Tsang 20938, 21498; S. K. Lau 975.*—KIANGSI: *S. K. Lau 4545, 5130.*

This species is easily recognized by its extremely large, obovate-elliptic leaves 25–30 cm. long and up to 9 cm. broad. Liou included this species under *Neolitsea lanuginosa* (Nees) Gamble. The latter, however, has glabrous branchlets, smaller leaves less glaucous on the lower surface; the veins are less conspicuous above, showing as a mere thread, and are more pubescent below, the transverse venation being inconspicuous; the fruits are borne on more slender pedicels. For these reasons, it has seemed advisable to keep the Chinese species apart from the Indian.

The place of the species in *Neolitsea* is not at all assured. The leaves, as Merrill states, are unusually large for the genus, and it is more probable that the plant belongs to *Lindera*. Until ♂ flowers are found it will be left in *Neolitsea*.

15. **Neolitsea Howii**, spec. nov.

Arbor vel frutex . . . m. altus, ramulis teretibus pallide brunneis adpresse pubescentibus canescentibus. Folia in apice ramulorum, coriacea, obovata, 9.5–18 cm. longa, 3.5–7 cm. lata, in acumen abrupte producta, ad basin acuta, supra subtusque sub lente minute reticulata, pallide viridia, glabra, subtus glauca, glabrescentia, triplinervia, nervis in jugo infimo oppositis, ad 1 cm. supra laminae basim confluentibus, reliquis subalternatis ad apicem laminae confertioribus, nervis flavis subtus magis prominentibus quam supra, subtus pubescentibus, nervulis e primo jugo ortis 6–8 arcuatis, ad marginem laminae excurrentibus, petiolis 1–1.5 cm. longis crassis rugosis adpresse pubescentibus. Inflorescentia subumbellata, ad 7-flora, axillaris, sessilis. Flores ♂ et ♀ ignoti. Fructus ellipsoideus, 12 mm. longus, 9 mm. latus, pallide brunneus, glaber, breviter apiculatus, cupula 2–3(4) mm. longa, 7–8 mm. lata, extus rugosa intus pubescente, pedicello 4–5 mm. longo, crasso rugoso.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: Po-ting, *F. C. How 73402* (type, AA).

The species is distinguished by the large obovate glaucescent leaves and the greyish pubescence of the branchlets. The umbels in fruiting stage show in the center a small undeveloped bud with light, very closely appressed pubescence.

The species is named after the collector of the type specimen.

16. **Neolitsea alongensis** Lecomte, Fl. Gén. Indoch. 5: 143. 1914; Liou, Laurac. Chine Indoch. 147. 1932.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. TONKIN: *H. Lecomte & A. Finet 819* (type, Paris).—ANNAM: *E. Poilane 24564.*

The leaves of this species are broadly elliptic or oblong elliptic-obovate, abruptly and very sharply acuminate, coriaceous, triplinerved at base, minutely reticulate, glaucous below and glabrescent on the veins. The difference between the new shoots and the branches of the previous year is so striking

in this species as to deserve comment, since the branches of the type are not young shoots. On the new growth the branches and the surface of the leaves are covered with a light red-brown tomentum, the veins being the last to lose their pubescence on approaching maturity. On the older branches the pubescence has become darker brown, shorter and more closely appressed.

17. **Neolitsea Poilanei** Liou, Laurac. Chine Indoch. 149. 1932.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. ANNAM: *E. Poilane 18416* (type, Paris).

The species is unusual in the pubescence of the ovary and staminodia, and the presence of large elongated sacs at the base of the glands on the two innermost staminodia. Liou draws attention to the resemblance of this species to *Neolitsea pulchella*. Except for the leaves being of much finer texture, vegetatively *N. Poilanei* is similar to *N. Chuii*.

18. **Neolitsea Merrilliana**, spec. nov.

Neolitsea zeylanica Merr. var. *obovata* Liou, Laurac. Chine Indoch. 153. 1932.

Arbor parva, ramulis teretibus striatis saepe nodulosis brunneis. Folia in apice ramulorum, coriacea, elliptica, 5–7 cm. longa, 2.2–3.5 cm. lata, subacuta, obtusa vel abrupte acuminata, acumine obtuso, ad basin acuta, concoloria, glabra, supra subtusque conspicue reticulata, triplinervia, nervis in jugo infimo oppositis, ad 0.5 cm. supra laminae basim confluentibus, reliquis subalternatis ad apicem laminae confertioribus, petiolis 5–10 mm. longis rugosis, maturis glabris. Inflorescentia subumbellata, axillaris, solitaria, subsessilis. Flores pedicello 2–3 mm. longo, sericeo-pubescente, corolla 6 mm. longa, perianthii tubo brevissimo, lobis 4, ellipticis ciliatis extus pubescentibus intus glabris. Flores ♂ subexserti, staminibus 6, 2 interioribus biglandulosis, glandulis ad basin adnatis subsessilibus, filamentis glabris ad basin pilis penicillatim dispositis; ovario rudimentali. Flores ♀ minores, ovario ovoideo, stigmate patente. Fructus globosus, 6–7 mm. latus, longe apiculatus, rugosus, brunneus, disco minimo plano; pedicello incrassato glabrescente, 5–6 mm. longo.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. ANNAM: *J. & M. S. Clemens 4225* (type, AA); *A. Chevalier 41202; E. Poilane 7091, 8731* (syntype of *N. zeylanica obovata* not seen, Paris), *5905* (syntype of *N. zeylanica obovata*, Paris; photo., AA), *5935, 5977* (syntype, Paris).—CAMBODIA: *A. Chevalier 35996* (less conspicuous reticulation of leaves).

The variety has been transferred to the species with the attending description, because it fits into a series with the rest of the specimens cited above. The name *obovata* has not been kept because it is not entirely applicable. *Neolitsea Merrilliana* has been placed under *Lindera Myrrha* (Lour.) Merr. and under *Cinnamomum*, presumably because of the very fragrant bark. It differs from the latter, however, in its nearly sessile umbellate inflorescence, and its flower structure. Just what *Lindera Myrrha* is, it is difficult to state with finality, there being no specimen extant of Loureiro's species. Except for the mention of nine stamens in the original description, *Neolitsea Merrilliana* corresponds very well to *Lindera Myrrha*. In fact, Chevalier's specimen was previously determined as the latter. There is a resemblance to several other species of *Neolitsea*, among them *N. elaeocarpa*, from which it is easily distinguished by the broader more obtuse leaves; and also *N. scrobiculata* from India, which has larger and more acuminate leaves.

It is a pleasure to name this species for Dr. E. D. Merrill, Director of the Arnold Arboretum, who for many years has been a keen student of plants of the Orient.

19. **Neolitsea umbrosa** (Wall.) Gamble in Sargent, Pl. Wilson. 2: 79. 1914; Liou, Laurac. Chine Indoch. 151. 1932.

Tetranthera umbrosa Wall. List No. 2564. 1830, nomen nudum.

Tetradenia umbrosa Nees in Wall. Pl. As. Rar. 2: 64. 1831, excl. var. β (based on *Tetranthera umbrosa* Wall.).

Tetradenia consimilis Nees, l. c.

Litsea umbrosa Nees, Syst. Laurin. 623. 1836.

Litsea consimilis Nees, l. c. 628 (excl. syn. *Laurus involucrata* Roxb.).

DISTRIBUTION: India (and reported from China).

INDIA. SILHET: *N. Wallich 2564* (isotype of *Tetranthera umbrosa*, Kew, see footnote p. 370); *N. Wallich 2567B* (isotype of *Tetradenia consimilis* not seen, Kew!).

From the material I have seen of *Litsea consimilis*, compared with the type of *N. umbrosa*, the two seem to be distinct species.

The former has larger oblong leaves, more numerous pairs of veins more or less equidistant, the first pair giving the appearance of triplinerves, are stronger and longer than the rest. This is a characteristic of *Laurus involucrata,* which I feel is a synonym of *Litsea consimilis.*

There are no specimens from China which correspond to *Neolitsea umbrosa,* but numerous specimens answering the description of *Litsea consimilis* in eastern China.

Although I feel that these are distinct, I shall avoid making a new combination under *Neolitsea,* but shall keep the synonyms as given above until such time as the type of *L. consimilis* is available.

20. **Neolitsea pulchella** (Meissn.) Merr. Philip. Jour. Sci. Bot. Bot. **13**: 137. 1918; Chun, Contr. Biol. Lab. Sci. Soc. China, 1^5: 67. 1925; Liou. Laurac. Chine Indoch. 150. 1932.

Litsea pulchella Meissn. in DC. Prodr. 15^1: 224. 1864.
Litsea Zeylanica var. *Chinensis* Benth. in Hook. f. Jour. Kew Gard. Miscel. **5**: 199. 1853.

DISTRIBUTION: China (Kwangtung).
CHINA. KWANGTUNG: *J. G. Champion 162* (type of *Litsea pulchella,* Kew†); *J. G. Champion* (type of *Litsea zeylanica* var. *chinensis,* Kew†).

The species has been for many years confused with *N. zeylanica,* from which it is readily distinguished by its smaller leaves, 5 or often 6 cm. long, elliptic, acuminate and much more symmetrical than those of *N. zeylanica.* The nerves of *N. pulchella* are inconspicuous above as compared with those of *N. zeylanica.*

21. **Neolitsea zeylanica** (Nees) Merr. Philip. Jour. Sci. Suppl: 57. 1906; Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. **5**: 94. 1913; Fl. Gén. Indoch. **5**: 142. 1914; Liou, Laurac. Chine Indoch. 152. 1932.

Litsea zeylanica Nees, Amoen. Bot. Bonn. fasc. 1: 58, pl. 5 (Cinn. Disput.). 1823; Bl. Bijdr. 559. 1825; Nees, Syst. Laurin. 626. 1836; Wight, Icon. Pl. 1: pl. 132. 1839; Bl. Mus. Bot. Lugd.-Bat. 1: 346. 1851.
Tetradenia zeylanica Nees in Wall. Pl. As. Rar. **2**: 64. 1831; **3**: 30. 1832.

DISTRIBUTION: southern Asia through Malaya to Australia.
CEYLON: (type, Herb. Royeni, not seen, Leiden†).

The plant has oblong or elliptic leaves attenuate at the apex, with an obtuse acumen, glaucous below, the costa, petioles and new branchlets yellowish sericeous and very densely appressed tomentose.

21a. **Neolitsea zeylanica** (Nees) Merr. var. **Fangii** Liou, Laurac. Chine Indoch. 154. 1932.

DISTRIBUTION: China (Szechuan).

CHINA. SZECHUAN: *W. P. Fang 5775* (type, Paris; isotype, AA).

The variety is distinguished from the species proper by the slightly pedunculate inflorescence, and the stamens being variable in number (6–8). Liou suggests that because of the variable number of the stamens the variety is a connecting link between *Neolitsea* and *Litsea*. The flowers which I examined all had six fertile stamens.

22. **Neolitsea ellipsoidea**, spec. nov.

Arbor ad 30 m. alta, ramulis teretibus rugosis glabris primo flavescenti-brunneis. Folia in apice ramulorum, coriacea, elliptica vel late elliptica, 6–10 cm. longa, 2–4.5 cm. lata, acuta vel obtusa, acuminata, ad basin acuta, concoloria, glabra, minute plus minusve reticulata sub lente. Folia triplinervia, nervis in jugo infimo oppositis, ad 1 cm. supra laminae basim confluentibus, reliquis subalternatis ad apicem laminae confertioribus supra subtusque flavescentibus prominulis, petiolis 2–3 cm. longis, glabris flavis longitudinaliter rugosis. Inflorescentia umbellata, 2–5-flora, solitaria, breviter pedunculata, pedunculis 1–2 mm. longis, glabris. Flores pedicello ferrugineo-pubescente 3–4 mm. longo, corolla 4–5 mm. longa, perianthii tubo perbrevi, lobis 4, ellipticis ciliatis extus pubescentibus intus glabris; flores ♂ staminibus 6, filamentis pubescentibus. Flores ♀ parvi, staminodiis circiter 6, ovario ovoideo glabro, stigmate discoideo. Fructus ellipsoideus, 15–17 mm. longus, 10–12 mm. latus, brunneus, glaber, disco parvo plano, pedicello percrasso 8 mm. longo 2 mm. lato.

DISTRIBUTION: China (Hainan).

CHINA. HAINAN: *N. K. Chun & C. L. Tso 44131* (type, AA); *F. C. How 73420; H. Y. Liang 63482; N. K. Chun & C. L. Tso 44163; C. Wang 34652, 35857.*

A very unusual species as to petioles and branchlets which are rugose and yellowish brown. In fruit, the pedicels are much more thickened than normally is the case in *Neolitsea*, and are elongated. The appearance of the fruiting branch as a result is clumsy.

23. **Neolitsea polycarpa** Liou, Laurac. Chine Indoch. 150. 1932.

DISTRIBUTION: French Indo-China.
FRENCH INDO-CHINA. TONKIN: *E. Poilane 13093.*—ANNAM: *E. Poilane 11025.*

The species is characterized by elliptic, very long-acuminate, rather coriaceous leaves 11 × 3.5 cm., glaucous below. The branches are subverticillate, an unusual feature to be noted on an herbarium sheet. The species is similar to *N. zeylanica* (Nees) Merr. but is distinguished from the latter by the above characters. Only the fruiting inflorescence and young female flowers have been described. Liou places the plant in *Neolitsea* because of the floral structure. Staminate material may change this conception.

24. **Neolitsea Chuii** Merr. Lingnan Sci. Jour. 7: 306. 1929; Liou, Laurac. Chine Indoch. 147. 1932.

Neolitsea subfoveolata Merr. Lingnan Sci. Jour. 7: 306. 1929, in nota; Merr. apud Groff, Lingnan Univ. Sci. Bull. No. 2: 48. 1930, *nomen nudum;* Metc. Lingnan Sci. Jour. 14: 525. 1935.

DISTRIBUTION: China.
CHINA. KWANGTUNG: *W. T. Tsang & F. Wong 14799* (type of *Neolitsea Chuii*, NY); *W. T. Tsang 20193; F. A. McClure 13756* (type of *N. subfoveolata* not seen, NY!); *W. Y. Chun 5744; S. P. Ko 50087, 50091, 50249; T. M. Tsui 769; S. S. Sin 11880.*—KIANGSI: *S. K. Lau 4696.*—KWANGSI: *R. C. Ching 8229.*

The species is characterized by its coarse triplinerved, elliptic to oblong-elliptic to ovate-elliptic leaves, minutely reticulate on both surfaces. The plant is glabrous throughout except for the inflorescence. No staminate specimen as yet has been reported but it is undoubtedly a *Neolitsea*. The specimen collected by Chun has been misdetermined several times, hence it is included above. Metcalf has seen the types or isotypes of *Neolitsea Chuii*, and *N. phanerophlebia* (from which Merrill,

l.c. distinguishes *N. subfoveolata)* as well as *McClure no. 13756* cited by Groff as *N. subfoveolata* Merr. Thus his interpretation is without doubt correct, and should be accepted. The specimens collected by Tsai *(51693, 51551, 51676, 51718)*, and determined by Hu as *N. Chuii,* perhaps should be treated as a western variety of that species, since there are apparent differences between these and the plants from Kwangtung. For the present it is best that they remain under the species.

24a. **Neolitsea Chuii** Merr. f. **annamensis** Liou, Laurac. Chine Indoch. 147. 1932.

DISTRIBUTION: known only from type locality.
FRENCH INDO-CHINA. ANNAM: *E. Poilane 1142* (type, Paris).

The leaves of this form are smaller, have shorter petioles and more apparent transverse veins.

25. **Neolitsea phanerophlebia** Merr. Lingnan Sci. Jour. 7: 305. 1929; Liou, Laurac. Chine Indoch. 149. 1932.

DISTRIBUTION: China (Kwangtung).
CHINA. KWANGTUNG: *K. P. To, W. T. Tsang & U. K. Tsang 12515* (type, NY); *T. M. Tsui 740, 822; W. T. Tsang 21230.*

The species suggests *N. Chuii* Merr., but it differs in the presence of an indumentum on the leaves, branchlets and petioles, the leaves being more glaucous beneath and distinctly appressed-pilose with scattered hairs. Merrill gives the lack of subfoveolate leaves as another distinction, but I can see no difference in the reticulation of the two species.

25a. **Neolitsea phanerophlebia** Merr. f. **glabra** Liou, Laurac. Chine Indoch. 149. 1932.

DISTRIBUTION: China (Kwangtung and Kiangsi).
CHINA. KWANGTUNG: *C. Wang 3221* (type, NY); *N. K. Chun & C. L. Tso 44294.*—KIANGSI: *S. K. Lau 3981, 4423, 4820.*

This is a very striking plant, first because of its small leaves glaucous beneath, and second because the two basal lateral veins are so prominent as to appear triplinerved. They branch off from the midrib 1–2 mm. above the base and follow the outline of the leaf, about 1–2 mm. from the margin, up to the middle of the leaf. Numerous specimens have been labeled as

the variety *glabra*, but they are the new species *N. Merrilliana* Allen.

EXCLUDED SPECIES

Neolitsea Playfairii (Hemsl.) Chun, Contr. Biol. Lab. Sci. Soc. China, 1¹: 66. 1925 = **Lindera Playfairii** (Hemsl.) comb. nov., see p. 400.

Neolitsea subcaudata Merr. Philip. Jour. Sci. Bot. **13**: 137. 1918 = **Lindera subcaudata** (Merr.) Merr.

Neolitsea spec. Rehd. Jour. Arnold Arb. **10**: 193. 1929 = **Litsea Kobuskiana** Allen, nom. nov.

Neolitsea spec. Rehd. l.c. = **Litsea Dunniana** Lévl.

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Synonyms are printed in *italics;* new names in **bold-face** type.

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A MONOGRAPH OF THE GENUS HEMIMERIS

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HISTORY

The genus *Hemimeris* was first described by Linnaeus[1] in 1760. He neglected to explain the origin of the name, but according to Sir J. J. Smith[2] it is derived from two Greek words, ἡμί, meaning "half" and μέρος, "a part or fragment," referring to the flower which is cut away on one side, that is, lacking a spur. It has been claimed that it was because of this character that Linnaeus originally separated this group from *Antirrhinum*. The name might possibly refer as well to the stamens, inasmuch as *Hemimeris* has half the number found in most genera of the *Scrophulariaceae*.

The status of the name has become confused since it has not been possible to determine exactly what Linnaeus had in mind when he described *Hemimeris bonae-spei*, and also by the fact that Linnaeus fil., in dealing with *Hemimeris*, entirely ignored his father's description and formulated a new one based chiefly upon plants collected by Thunberg. The name *Hemimeris bonae-spei*, some authorities claim, was applied by Linnaeus to the plants now known as *Diascia diffusa*. Were this true, the name *Diascia* would have to be included in the list of *Nomina Conservanda*, or the plants known by that name for one hundred years or more would have to be changed to *Hemimeris* and those now known as *Hemimeris* would have to be given another name. Hiern believed that this change should be made,[3] and in the original manuscript for the 'Flora Capensis' actually did interchange the two names. However, Thiselton-

[1] L. Pl. Rar. Afr. 8. 1760.

[2] J. J. Smith in Rees' Cycl. 17: 44. 1819.

[3] Hiern in Jour. Bot. 39: 103. 1901.

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Dyer, the editor, did not agree and published[4] the account under the names in use at that time. The present writer does not accept the argument set forth by Hiern and agrees with Bentham[5] that the name *Hemimeris* should be maintained for the group under discussion.

The history of the genus is somewhat complicated. Linnaeus described *Hemimeris bonae-spei*[6] in 1760, as follows: "Veronica africana, floribus ad genicula pedicellis biuncialibus. Herm. Afr. 783, (Pluk. phyt. 320. *f.5).* Herba statura pedicularis. Caules pedales, prostrati, laeves. Folio inferne terna (superiora ad flores saepe alterna), petiolata, lanceolata, obtusa, pinnatifida. Flores axillares, alternii. Pedunculo longo, sed calyx 5-partitus." The illustration cited from Plukenet is *Scoparia dulcis* according to Britten.[7]

Linnaeus later transferred *Hemimeris bonae-spei* to *Paederota* as *P. bonae-spei*[8] and repeated the original description, adding the phrase "fol. pinnatifidis" and placing the whole under "Diandra." Hiern stated that this last addition "made no difference in effect,"[9] but it is difficult to understand why he took this position in view of the fact that the most important difference between the two genera is that there are two stamens in *Hemimeris* and four in *Diascia.* It must be recalled also that the true *Paederota* has two stamens. The rest of the description is a repetition of the original and most of it could fit any one of the species now known as *Hemimeris sabulosa, H. montana, Diascia diffusa,* or *D. Bergiana,* with the exception of the color "purpurei lineis albentibus." This is the color of the flowers in *Diascia diffusa* and *D. Bergiana. Hemimeris* has yellow flowers. The phrase "folia inferne terna" does not apply to any species of *Diascia* now known, but in several specimens of *Hemimeris sabulosa* the lower leaves appear to be ternate and in some collections the lowermost are trilobed. The

[4] Th.-Dyer in Fl. Cap. 4²: 139. 1904.
[5] Benth. in Hook. Comp. Bot. Mag. 2: 13. 1836.
[6] Linn. l.c.
[7] Britten in Jour. Bot. 47: 45. 1909.
[8] Linn. Sp. Pl. ed. 2, 20. 1762; Amoen. Acad. ed. 1, 6: 83. 1763, and ed. 2, 1764.
[9] Hiern, l.c.

use of the name *Paederota bonae-spei* was continued through many subsequent publications and always under "Diandra."

In the synonymy given in the 'Amoenitates Academicae,' Linnaeus refers to a plant in "Pet. mus. 245," [recte 345]. This is in the Herb. Sloane in the British Museum, vol. 156, *f. 157*, and is *Hemimeris montana* without question. This is also the plant referred to in Roy. Lugd. 416. 1740, as "Anagallis foliis sinuatis." Linnaeus, in his original paper, stated that the plants described were based upon material mostly in the Burmann collection. This was a miscellaneous collection of specimens of Cape plants gathered by Hermann, Oldenland, Auge, and others. In the Burmann herbarium at Geneva, there are seven sheets of plants belonging to *Hemimeris*, four of which are *H. sabulosa* and three *H. montana*. There are six sheets of *Diascia*, four being *D. diffusa*, the common species in the vicinity of the Cape, one *D. macrophylla*, and one which may be identified with some doubt as *D. Bergiana*. The collectors of these plants are unknown.

In the Linnaean Herbarium at London there are three sheets of *Hemimeris montana*, one of *H. sabulosa*, and two of *Diascia diffusa*. These were collected by Sparrman, Thunberg, or Fabricius, after Linnaeus had published his 'Plantae Africanae Rariores,' so may be disregarded as far as this problem is concerned. That confusion existed in the mind of Linnaeus at this time is evidenced by the labels on the three sheets of *Hemimeris montana*, two being labelled by him as "montana" and the third as "diffusa."

Linnaeus fil. described the genus *Hemimeris*[10] without any reference whatever to a previous publication. He listed *H. sabulosa*, *H. montana*, and *H. diffusa*, citing Thunberg's collections and placing all of them under "Didynamia" in spite of the fact that his *H. diffusa* was the only one having four stamens. Both Lamarck[11] and Richter[12] claim that Linnaeus fil. considered *H. diffusa* to be a variety of *H. sabulosa*. Thunberg,[13] Jussieu,[14] and Willdenow[15] also listed the species with

[10] Linn. f. Suppl. 45 and 280. 1781.
[11] Lamarck, Cycl. 3: 104. 1789.
[12] Richter, Codex. 29. 1840.
[13] Thunberg, Nov. Gen. Pl. 74. 1784.
[14] Jussieu, Gen. Pl. 120. 1789.
[15] Willdenow, Sp. Pl. 3: 282. 1800.

either two or four stamens under *Hemimeris,* and in Richter's 'Codex,' we find *Paederota bonae-spei* used for the last time.

Sir J. J. Smith[16] in Rees' 'Cyclopaedia' gave *Paederota bonae-spei* as a synonym of *H. diffusa* saying, "We can hardly doubt that the original *Hemimeris* (afterward called *Paederota) bonae-spei* is this species though it was at first described as diandrous." This opinion is discredited by the fact that there is in the Linnaean Herbarium a sheet of so-called *Hemimeris diffusa* on which the "*Hemimeris*" is in Linnaeus' handwriting, the "*diffusa*" in that of his son, and on the back of the same sheet, again in Linnaeus' handwriting, is a description of the plant which Smith claims is the original description. For some reason, Smith failed to note that this plant was collected by Sparrmann some years after *Hemimeris* was first published and therefore it cannot be the original description.

Link and Otto[17] described the genus *Diascia* in 1820, basing it upon material grown from seed sent by Bergius from the Cape. They named the species *D. Bergiana* and in no way did they refer to any previous publication nor suggest possible relationship between *Diascia* and any other genus. Sprengel[18] recognized *Diascia* as a genus under the caption "Didynamia" and listed four species, three of which belong in *Diascia,* as now interpreted, and one in *Hemimeris.* Under the latter genus, he enumerated a number of species, all natives of South America, which are now attributed to *Alonsoa.*

Bentham,[19] in his synopsis of the *Hemimeridae,* was the first to separate the two groups definitely, retaining the name *Hemimeris* for the plants having two stamens and *Diascia* for those with four. He did this, he said, because the name *Diascia* was more particularily applicable to the form of the corolla of that group. However, he followed Smith in believing that Linnaeus referred to a four-stamened flower in the original description. As a matter of fact, no reference was made to the number of stamens in the first publication. Bentham listed

[16] J. J. Smith in Rees' Cycl. 17: 44. 1819.
[17] Link & Otto, Ic. Pl. Sel. 7, *t.s.* 1820.
[18] Sprengel, Syst. Veg. ed. 16, 2: 800. 1825.
[19] Benth. in Hook. Comp. Bot. Mag. 2: 13. 1836.

three species under *Hemimeris* and seventeen under *Diascia*. Hiern, the most recent author to study these genera in detail, as mentioned before, believed that the generic names should be transposed. He based most of his argument upon plants in the Sloane collection, none of which were collected by Hermann, and upon certain plants in the Linnaean herbarium which, as shown above, were collected after Linnaeus had described the genus. Four species were listed under the generic name *Hemimeris* in the 'Flora Capensis.'

GEOGRAPHICAL DISTRIBUTION

Hemimeris is a small genus confined to the western and southwestern parts of the Cape Province in South Africa. It grows commonly in soil of decomposed sandstone, in crevices where there is more or less moisture, and in cultivated areas of clay or sandy loam. Its center of distribution is in the Cape and in the adjacent districts of Stellenbosch, Paarl, and Malmsbury, where it sometimes becomes so abundant as to color a large area. The two common species, *H. sabulosa* and *H. montana*, occur chiefly in this region. Both continue northward into Namaqualand, *H. montana* occurring almost as far north as the Orange River, and eastward along the coast for some distance. *H. centrodes* is a somewhat localized northwestern species, having been collected only in the Bokkeveld and in the mountains of the Calvinia District. *H. gracilis* seems to be even more restricted, but that may be due to a paucity of collections from the areas in which it grows. It is represented by only a few sheets of specimens gathered in the Worcester District, in the Onder Bokkeveld, and near Van Rhynsdorp. In the Onder Bokkeveld, it occurs within the range of *H. centrodes*.

PHYLOGENY

H. sabulosa appears to be the most primitive species of *Hemimeris* in having the least specialized corolla and more or less glabrous stems. The corolla is more nearly regular and the pouches are not at all well developed. One can readily conceive that *H. montana* has been derived from some such primi-

tive type through specialization toward a more conspicuously irregular corolla and larger pouches. The sacs of *H. montana* are prominent and the stamens frequently are hidden by the overarched posterior corolla lip. The size of the sacs varies considerably, and specimens in which they have attained almost the length of the lateral lobes have been designated as var. *pachyceras*. This variety is found mostly in the semi-arid parts of the western Cape Province, extending north into Namaqualand and east as far as Calvinia.

Through enlargement and elongation of the spurs, it is not difficult to hypothesize the remaining two species as having been derived from *H. montana*. *H. centrodes* and *H. gracilis* are localized species in which long spurs have been developed. *H. centrodes* superficially resembles *Diascia*, especially *D. macrophylla*, and has therefore been confused with members of that genus. *H. gracilis* differs from its congeners in having a conspicuously winged style and strongly divergent spurs. Certain other species have narrowly winged styles but in *H. gracilis* this tendency attains an extreme development.

In its affinities, *Hemimeris* unquestionably approaches *Diascia* closely. It differs from *Diascia* chiefly in the reduction of the number of stamens and in the method of the dehiscence of the capsule, this occurring in such a way that the base of the persistent style is split into four parts. In *Diascia* the base of the style is split into two parts, as a rule, but sometimes into four. The two genera are alike in the basal circumflexion of the anterior stamens, in having two sacs or spurs, and in the general shape of the capsule. In both genera the seeds are usually destitute of wings, but occasionally narrow wings are developed.

ABBREVIATIONS

Abbreviations indicating the herbaria in which specimens cited in this paper are deposited are as follows:

A—Albany Museum at Grahamstown.

B—Herbarium of the Botanic Garden and Museum in Berlin-Dahlem.

BH—Bolus Herbarium at the University of Cape Town.

BM—Herbarium of the British Museum (Natural History), London.
F—Herbarium of the Field Museum of Natural History, Chicago.
FH—Herbarium of Mr. H. G. Fourcade.
G—Gray Herbarium of Harvard University, Cambridge.
Gen—Herbarium of the Botanic Garden, Geneva.
K—Herbarium of the Royal Botanic Gardens, Kew.
L—Linnaean Herbarium of the Linnaean Society, London.
M—Herbarium of the late Dr. Marloth, now a part of the National Herbarium in Pretoria.
MBG—Herbarium of the Missouri Botancial Garden, St. Louis.
P—Herbarium of the Academy of Natural Sciences of Philadelphia.
US—United States National Herbarium, Washington.

The author wishes to express her sincere appreciation to the curators of the herbaria enumerated above for their courtesy and aid during her study of *Hemimeris*, especially to Sir Arthur W. Hill and Mr. A. D. Cotton, of the Royal Botanic Gardens at Kew, and Dr. Louisa Bolus, of the Bolus Herbarium, University of Cape Town.

TAXONOMY

Hemimeris L. Pl. Rar. Afr. 8. 1760, in part; L. f. Suppl. 45. 1781, in part; Murray, Syst. Veg. 561. 1784, in part; Thunb. Nov. Gen. Pl. 74. 1784, in part; Prodr. 105. 1800, in part; Fl. Cap. [ed. Schult.] 484. 1823, in part; Juss. Gen. Pl. 120. 1789, in part; ed. 2, 134. 1791, in part; Lam. Cycl. **3**: 104. 1789, in part, and Suppl. **3**: 45. 1813; L. Gen. Pl. ed. 8 [by Schreber] **2**: 409. 1791, in part; Willd. Sp. Pl. **3**: 282. 1800, in part; Gaertn. f. Fruct. et. Sem **3**: 21, *t. 183*. 1807; J. J. Smith in Rees' Cycl. **17**: 4H. 1819, in part; Spreng. Syst. Veg. **2**: 809. 1825; Endl. Gen. Pl. 672. 1836–40, in part; Benth. in Hook. Comp. Bot. Mag. **2**: 15. 1836; DC. Prodr. **10**: 255. 1846; Harv. Gen. S. Afr. Pl. 255. 1838; Benth. & Hook. Gen. Pl. **2**: 931. 1876; Hiern in Th.-Dyer, Fl. Cap. **4**^{2}: 164. 1904; Thonner, Fl. Pl. Afr. 490.

1915; Bews, Fl. Natal. 182. 1921; Phillips, Gen. S. Afr. Pl. 544. 1926; Levyns, Fl. Cape Pen. 224. 1929; Marloth, Fl. S. Afr. 3[1]: 129. 1932.

Paederota L. Sp. Pl. ed. 2, 20. 1762, in part; Amoen. Acad. ed. 1, **6**: 83. 1763, in part; and ed. 2. 1764, in part; Houtt. Handl. ed. 2, **7**: 107. 1777, in part; Richter, Codex, 29. 1840, in part.

Annuals, glabrous, glandular-pubescent or viscid-villous. Stems simple or more or less freely branched, quadrangular, often channelled or ridged; branches opposite. Leaves opposite, the uppermost sometimes alternate, petiolate, rarely sessile, simple, toothed, lobed, or pinnatifid, rarely almost entire, often with smaller leaves fascicled in the axils; cotyledonary leaves smaller, frequently persistent, petiolate, ovate, usually entire. Flowers axillary or terminal, solitary or more often in condensed racemes at the apex of the stem, these frequently with such short internodes as to appear umbellate; pedicels longer than the flowers, erect at anthesis, spreading or deflexed in fruit. Calyx campanulate, scarcely imbricate, 5-lobed, the lobes free nearly to the base, unequal. Corolla bilabiate, generally villous externally, yellow; tube very short or obsolete; throat short; the upper lip emarginate, smaller, exterior in the bud, usually with a reflexed margin and a more or less well-developed pouch near the center; lower lip 3-lobed, the lateral lobes short and broad, commonly with a large number of compound subsessile glands toward the base and two pouches or spurs at the base of the lip, the basal part of which is covered with sessile glands, sometimes with two appendages at the sides of the throat, lowermost lobe concave, much longer and broader, usually emarginate. Stamens 2, erect, inserted on the sides of the narrow throat; filaments usually compressed and often narrowly winged, circumflexed at the base; anthers large, one-celled through confluence, usually connivent when mature; pollen grains oval or rounded, smooth, pores numerous. Ovary 2-celled with axile placentation; style persistent, usually declined, longer or shorter than the ovary, frequently winged, the terminal portion stigmatose. Capsule ovate or subglobose, dehiscent both septicidally and loculicidally in

varying degrees, generally splitting the base of the style into four parts; placentae coherent, forming a central column. Seeds numerous, brown or black, oval, scarcely 1 mm. long, papillate, occasionally very narrowly winged. Embryo straight; cotyledons entire.

The position of the stamens and style in relation to one another and the well-developed nectaries at the base of the spurs or sacs would indicate that the flowers are insect-pollinated.

Standard species: *H. sabulosa* L. f. Suppl. 280. 1781. In view of the confusion existing as to the exact identity of *H. bonae-spei* and the apparent impossibility of settling it absolutely, *H. sabulosa* is designated as the standard species of the genus.

KEY TO THE SPECIES

A. Corolla with sacs or spurs much shorter than the lower lip of the corolla.
  a. Plants glabrous or nearly so; leaves lobed or pinnatifid; pouches shallow ..... *1. H. sabulosa*
  aa. Plants pubescent to villous; leaves shallowly or deeply toothed, rarely entire; pouches well developed ..... *2. H. montana*
AA. Corolla with spurs as long as or longer than the lower lip of the corolla.
  b. Corolla 0.8–1.5 cm. long, spurs nearly parallel, often incurved; style not conspicuously winged ..... *3. H. centrodes*
  bb. Corolla 0.4–0.6 cm. long, spurs straight, strongly divergent; style conspicuously winged ..... *4. H. gracilis*

1. H. sabulosa L. f. Suppl. 280. 1781; Thunb. Nov. Gen. Pl. 79. 1784; Prodr. 105. 1800; Fl. Cap. [ed. Schult.] 485. 1823; Murray, Syst. Veg. ed. 14, 561. 1784, and ed. 15, 598. 1797; Lam. Cycl. **3**: 104. 1789; Ill. *t. 532, fig. 2.* 1823; Willd. Sp. Pl. **3**: 282. 1800; Martyn in Mill. Dict. ed. 9. **1**: 142. 1807; Smith in Rees' Cycl. **17**: 4H. 1819; Benth. in Hook. Comp. Bot. Mag. **2**: 16. 1836; DC. Prodr. **10**: 256. 1846; Hiern in Th.-Dyer, Fl. Cap. **4**: 166. 1904.

Paederota bonae-spei L. Sp. Pl. ed. 2, 20. 1762, in part; Amoen. Acad. ed. 1, **6**: 84. 1763, in part, and ed. 2. 1764, in part, not Burm. f.; Hout. Handl. ed. 2, **7**: 107. 1777, in part; Murray, Syst. Veg. 61. 1797, in part; Richter, Codex, 29. 1840, in part.

[*Veronica Africana floribus ad genicula pediculis biuncialibus insidentibus.* Burm. Cat. Pl. Afr. 23. 1737.]

[*Alsines seu Spergulae dictae species africana.* Burm. Cat. Pl. Afr. 23. 1737.]

Annuals; stems quadrangular, simple or branched, erect or prostrate, glabrous or nearly so, 5–50 cm. high, frequently tinged with red; leaves opposite, thin, 1–4 cm. long, 0.2–1.0 cm. wide, ovate or oblong, sometimes nearly linear, obtuse, conspicuously dentate with blunt teeth to pinnatifid, occasionally 3–5-lobed, dark green or reddish, petioles usually slender, shorter than the blade, often with smaller leaves fascicled in the axils; flowers in the axils of the upper leaves, these frequently with such shortened internodes as to give an umbellate appearance, or terminal on short branches; pedicels accrescent, 1.5–3.0 cm. long, spreading or deflexed at maturity; calyx-lobes 1.5–2.5 mm. long, oblong or lanceolate, obtuse or acute, unequal, the three upper erect and smaller, the two lower spreading; corolla yellow with white hairs without, glabrous within, 1.0–1.5 cm. long, upper lobes erect, emarginate, 3–4 mm. long, with a more or less circular depression below the center and generally with two patches of brown spots on either side of this, lateral lobes about 3 mm. long and 2 mm. wide, with groups of sessile glands near the center and an elongated shallow sac toward the base, lower lobe broadly rounded or oblong,

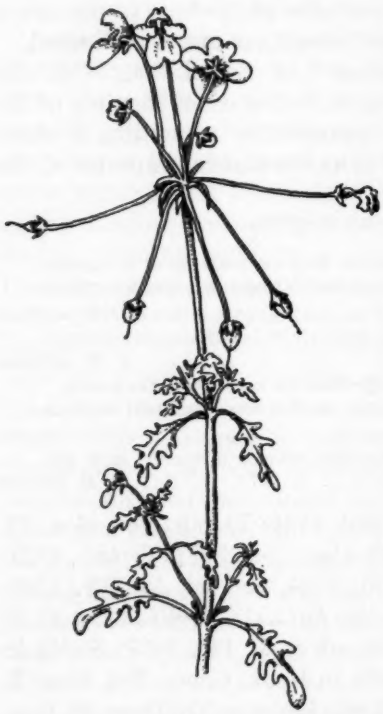

Fig. 1. *Hemimeris sabulosa* L. f., plant × 1.

6–8 mm. long and about as wide, throat very short; stamens erect, filaments glabrous, more or less winged, anthers coherent, not hidden by the upper lip; style longer than the stamens, bent toward the lower lip; capsule glabrous, globose or ovate, 4–5 mm. long, much longer than the calyx; seeds oval, brown, papillate.

Distribution: common in sandy soil from the Cape to Namaqualand and east to Riversdale, flowering from July to November.

CAPE PROVINCE: without definite locality or date, *Forbes* (K, B); *Harvey* (K); *Menzies* (K); *Thunberg 185* (L, TYPE); ex Link Herb. (B); *Mund & Maire* (B); *Burmann* (Gen); *Sieber 381* (Gen, MBG); Doorn River, Sept., 1900, *Pritzel* (B); Alexander's Hoek, 2 Sept., 1894, *Schlechter 5137* (A, B); Zeekoe Vlei, 12 Aug., 1896, *Schlechter 8482* (K, B, Gen, A, US, P, MBG); Olifant's River and near Brakfontein, 1836, *Zeyher 1268* (K, B); Clanwilliam, Aug., year lacking, *Ecklon & Zeyher* (A); Clanwilliam, *Zeyher* (K); Veld Drift, 29 Sept. 1927, *Grant 3461* (Gen, K, P, MBG); near Hopefield, Sept., 1885, *Bachmann 1168* (B); same locality, Aug., 1886, *Bachmann 1167* (B); Sept., 1883, *Bachmann 75, 1169* (B); near Hopefield, 11 Aug., 1929, *Grant 4639* (K, Gen); sandy areas between Darling and Yserfontein, 18 Aug., 1929, *Grant & Theiler 4652* (K, B, Gen, BH, P, MBG); Zwaartwater Farm, near Darling, 30 Sept., 1926, *Grant 2525* (BH, K, P, MBG); Yserfontein, 30 Sept., 1926, *Grant 2582* (BH, B, P, MBG); along roadside between Darling and Yserfontein, 30 Sept., 1926, *Grant 2551a* (BH, K, P, MBG); Paarl, date lacking, *Drege* (A); Hottentot's Holland, date lacking, *Sprengel's Herb. 381* (B); near Zoutrivier, 15 Sept., 1816, *Bergius* (B); strand by Green Point, 19 Sept., 1883, *Wilms 3499* (B); Kalk Bay, Oct., year lacking, *Pappe* (A); Simon's Bay, 1853–56, *Wright* (G, US); Cape, 21 Aug., 1816, *Bergius* (B); sand flats between Blaauberg and Tygerberg, date lacking, *Drege 3151d* (K, MBG); mountains near Cape Town, date lacking, *Ecklon* (K, B); sand dunes, Cape Town, date lacking, *Prior* (K, G); Camp Ground near Cape Town, 15 Aug., 1895, *Wolley Dod 163* (K); Zeekoe Vlei near Cape Town, 28 Sept., 1929, *Starke* (MBG, P); near Muizenberg, 31 July, 1892, *Schlechter 1266* (K, B, A, Gen); Elands Kop in the Duinen, Riversdale District, Sept., 1914, *Muir 1764* (A).

Undoubtedly Linnaeus had this species in mind when he described *Hemimeris bonae-spei*, as stated before. However, since he confused several things in his original description and since the specimen of Hermann upon which he based the genus cannot be found, it seems advisable to retain the well-established name *Hemimeris sabulosa* and so avoid possible confusion.

The specimen of Bergius collected in 1816 from "Cape Bonae Spei" differs from most of the other collections in having

leaves intermediate between *H. sabulosa* and *H. montana*. The glabrous character of the plant and the flowers are like those in typical specimens of *H. sabulosa*. *Schlechter 1266*, as seen in several herbaria, has similar leaves, some of which are trilobed. The specimens of Pappe at the Albany Museum resemble those collected by Schlechter.

2. H. montana L. f. Suppl. 280. 1781; Thunb. Nov. Gen. Pl. 75. 1784; Prodr. 105 1800; Fl. Cap. [ed. Schult.] 484. 1823; Murray, Syst. Veg. 561. 1784; Willd. Sp. Pl. **3**: 282. 1800; Martyn in Miller, Dict. ed. 9, **1**: 142. 1807; Smith in Rees' Cycl. **17**: 4H. 1819; Benth. in Hook. Comp. Bot. Mag. **2**: 16. 1836; DC. Prodr. **10**: 255. 1846; Hiern in Th.-Dyer, Fl. Cap. **4**^{2}: 165. 1904; Levyns, Fl. Cape Pen. 224, *fig. 167*. 1929.

Hemimeris alsinoides Lam. Cycl. **3**: 105. 1789; Ill. *t. 532. fig. 1a–b*. 1823.

Hemimeris sinuata Smith in Rees' Cycl. **17**: 4H. 1819.

Hemimeris sessilifolia Benth. in Hook. Comp. Bot. Mag. **2**: 16. 1836, excluding Burchell's specimen; DC. Prodr. **10**: 255. 1846.

Diascia montana (L. f.) Spreng. Syst. Veg. **2**: 800. 1825.

Hemimeris montana L. f. var. β *latipes* Benth. in DC. Prodr. **10**: 256. 1846.

Hemimeris latipes Backhouse ex Hiern, in Th.-Dyer, Fl. Cap. **4**^{2}: 165. 1904.

Diascia Scullyi Hiern in Th.-Dyer, Fl. Cap. **4**^{2}: 144. 1904.

? Paederota racemosa Houtt. Handl. ed. 2, **7**: 110, *t. 38, fig. 1*. 1777.

[*Anagallis purpurea bursa pastoris foliis minoribus* Petiv. Mus. 36. no. 345. 1695; Roy. Ludg. 416. 1740.]

[*Anagallis capensis Chamaedryos folio, caule piloso* Ray, Hist. Pl. **3**, app. 241. 1704.]

[*Alsine chamaedrios foliis bijugis Spergula floribus* Pluk. Phyt. *t. 331, fig. 3*. 1691; Mant. 9, *t. 331, fig. 3*. 1700.]

Stems 8–35 cm. long, quadrangular, often channelled, simple, or more commonly branched, erect or ascending, occasionally weak and more or less scrambling, usually glandular and viscid-villous with conspicuous white hairs, sometimes nearly

glabrous; leaves broadly or narrowly ovate, occasionally lanceolate or elliptical, obtuse or less often acute, commonly serrate with blunt teeth, at times nearly entire, 1–5 cm. long, 0.5–2.5 cm. wide, generally much shorter than the internodes, dark green above, sometimes tinged with red or reddish-purple, pubescent or villous, frequently with a group of long white hairs near the base, petioles slender, more or less winged, shorter or nearly as long as the blade, rarely longer, uppermost leaves with shorter petioles, occasionally subsessile; flowers mostly in terminal umbellate clusters consisting of 4–12 or more flowers subtended by leaf-like bracts, or sometimes axillary or solitary on short slender branches; pedicels generally filiform and more or less ribbed, infrequently flattened and more or less winged, 1–5 cm. long, glabrous to densely glandular-pubescent, ascending or nearly erect, sometimes deflexed when mature; buds conspicuous because of the white viscid-villous hairs on the outside of the corolla; calyx-lobes unequal, the uppermost one obovate, obtuse, the others narrower, elliptical or oblong, acute or obtuse, 1.5–2.5 mm. long, white viscid-villous to nearly glabrous; corolla bilabiate, yellow, viscid-villous without, upper lip strongly arched, 2–5 mm. long, emarginate, often with a somewhat circular group of brown spots on either side, lateral lobes larger, rounded, almost as long as broad, spreading, glandular-punctate toward the base and each with a rounded or oval sac at or below the center, this about 1 mm. long and about as deep, sometimes partly closed by two ascend-

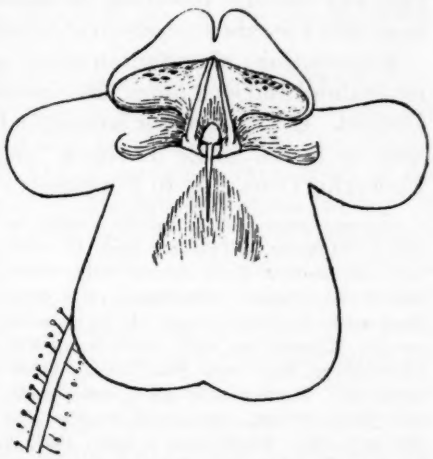

Fig. 2. *Hemimeris montana* L. f., flower × 6.

ing appendages, lowermost lobe broadly oblong, concave, 4–8 mm. long, 3–7 mm. broad, glandular-punctate near the base, truncate or rounded, usually emarginate; stamens included, anthers generally hidden within the arched upper lip, filaments glandular-pubescent, erect, anthers large, connivent; style longer than the stamens, inclined toward the lower lip, apex stigmatose; capsule glabrous or puberulent, broadly ovate or subglobose, as long as or slightly longer than the calyx, dehiscent nearly to the base along the outer suture and frequently part way from the top along the inner suture, splitting the style base into 4 strands; seeds oval, minute.

Distribution: abundant in sandy areas from the Cape to Namaqualand and east along the coastal region to Port Elizabeth District. Growing under bushes, in the open veld, in cultivated land or in the shade of rocks, frequently where it is moist. Flowering from July to November.

CAPE PROVINCE: without definite locality or date, *Garcin* in Burmann Herb. (Gen); *Thunberg*, in Linnaean Herb. (L TYPE); *Sparrmann 6* in Linnaean Herb. (L); *Oldenland* in Herb. Sloane (BM); *Prior* (K); Jan. 1880, *Rogers 13* (K); *Reeves* (K); *Harvey* (K); *Pappe* (K); *Sieber 144* (K, B, Gen); *Forbes* (K); *Burmann Herb.* (Gen); *Zeyher* (B, A); *Bergius* (B); *Mund & Maire* (B); *Ascherson* (B); Khamiesberg, under rocks, Beaem Hill, 15 Sept., 1911, *Pearson 6685* (K); Khamiesberg, Aug.–Sept., year lacking, *Bolus 9436* (BH, P, MBG); Namaroup, Sept., 1911, *Pearson 6600* (K); under rocks, Kharkams, Sept., 1911, *Pearson 6715* (K); Giftberg, Sept., 1911, *Phillips 7353* (K); Steinkop, Aug., 1925, *Marloth 6770* (M); Klipfontein, 8 Sept., 1925, *Marloth 12676* (M); Namaqualand Minor, Aug.–Sept., 1883, *Bolus 9436* (BH, P, MBG); Calvinia, 18 Sept., 1900, *Diels 759* (B); Nieuwerfontein, 26 Sept., 1929, *Grant 4869a* (BH, K, NH, P, MBG); Van Rhyns Pass, 28 Sept., 1929, *Grant 4880* (BH, P, MBG); Klaver, 30 July, 1920, *Andreae 428* (M); Klaver, 13 Sept., 1926, *Marloth 12942* (M); Cedarbergen, near Wupperthal, date lacking, *Drege 3151b* (K); Wupperthal, date lacking, *Drege 3151* (K); Het Kruis, Sept., 1912, *Stephens & Glover 8789* (K); Saldanha Bay, 7 Sept., 1929, *Grant 4546* (K, B, BH, P, MBG); Saldanha Bay, Sept., 1827, *Verreaux* (Gen); between Darling and Yserfontein, 18 Aug., 1929, *Grant 4658* (BH, P, MBG); Darling, Aug., 1883, *Bachmann 545* (B); Paarde Berg and Zwartland, date lacking, *Ecklon* (K, TYPE of *H. sessilifolia* Benth.); Wellington, Aug., 1886, *Cummings 74* (P, US); Stellenbosch, 1865, *Sanderson 972* (K); at the foot of Paarl Mt., date lacking, *Drege* (K, MBG); Diep Rivier, Oct., 1827, *Verreaux* (Gen); Simonstown, Aug., 1912, *Rogers 11247* (A); Simons Bay, 1853–56, *Wright* (K, US, MBG); above Groot Schuur, 29 July, 1895, *Wolley Dod 165* (K); Table Mt., Aug., year lacking, *Ecklon 391* (K, MBG); Camp Ground near Cape Town, Aug., 1875, *Bolus 2872* (K); Lion's Head near Camps Bay, Oct., 1896, *MacOwan 1768* (K, B, Gen); near Cape Town, date lacking, *Harvey 414* (K);

Cape of Good Hope, year lacking, *Harvey* (K, TYPE of *H. montana β latipes* Benth.); in grassy fields and shady places near the Cape, Aug.–Sept., year lacking, *Pappe* (K); waterfall on Devil's Peak, July, 1883, *Wilms 3497* (B, Gen, P); Cape of Good Hope, 1831, *Verreaux* (Gen); Cape of Good Hope, date lacking *Ecklon & Zeyher* (Gen); throughout Cape District, Aug., 1838, *Krauss 1634* (MBG); Cape, *Drege* (Gen); Table Mt., near Camps Bay, Aug., 1900, *Diels 17* (B); Camps Bay, Sept., 1884, *Marloth 461* (M); near Cape Town, Sept., year lacking, *Lehmann* (G); sand dunes near Cape Town, 5 Aug., 1846, *Prior* (K); Roggeveld Mts., 6 Aug., 1811, *Burchell 1307* (K); in sandy places, Tulbagh Kloof, Sept., 1888, *Tyson 2296* (M); Nieuwkloof near Tulbagh, Oct., 1886, *MacOwan 821*, in part (K, Gen); Hex River Pass, 13 Oct., 1928, *Grant 3804* (P); near Robertson, 30 Sept., 1929, *de Wet 4938* (NH, P); Riversdale, date lacking, *Rust 114, 226* (B); mouth of Knysna River, Oct., 1921, *Fourcade 1491* (FH); Humewood, Sept., 1911, *Paterson 17* (A); Port Elizabeth, Sept., 1908, *Drege 268* (A); Port Elizabeth Valley, Aug., 1912, *Paterson 2315* (A).

An exceedingly variable species as to the size of the flowers, the amount of pubescence, the size and shape of the leaves, the length of the pedicels, and the size and shape of the corolla-sacs. The upper petioles are occasionally very short or the leaves may be subsessile as in Ecklon's collection, the type of *H. sessilifolia*. But even on the type sheet of this species only the pair of leaf-like bracts is sessile. The size of the leaves varies greatly, apparently in direct relation to the amount of water and shade available. In moist shaded places, the plants are usually much larger in every way and generally more villous. This is well shown in *Grant 4843*, collected in Namaqualand. Typically the leaves are serrate or dentate, but on some specimens they are almost entire and on others, coarsely crenate.

2a. var. **pachyceras** (Diels) Grant, comb. nov.

Hemimeris pachyceras Diels in Engler's Bot. Jahrb. **44**: 121. 1909.

Corolla sacs broader and longer than in the species, varying from 1.5–2.0 mm. long and nearly as broad.

Distribution: in sandy areas or rocky places from Malmesbury District to Namaqualand and east to Mossel Bay.

CAPE PROVINCE: Moorreesburg, Nov., 1884, *Bachmann 722* (B); Olifant River Mts., 30 Aug., 1894, *Schlechter 5088* (K, B, Gen, A); Karree Berg, 23 July, 1896, *Schlechter 8289* (K, B, US, F, Gen, P, MBG); Namaqualand, without definite locality or date, *Scully 8* (K); southeastern slopes of Roepmyniet, 15 Sept., 1900, *Diels 1168* (B, TYPE of *H. pachyceras*); Calvinia, Sept., 1900, *Pritzel* (B); in hills,

Oorloogskloof, Onder Bokkeveld, 21 Aug., 1897, *Schlechter 10944*, in part (B, K, A, Gen, US, MBG); Vogelfontein, 14 Aug., 1896, *Schlechter 8517* (A, Gen, P, US, MBG, K, B); Gnagas Pass between Middlepost and Ceres, 28 Sept., 1929, *Grant 4916* (BH, P, MBG); foothills of Verlaten Kloof, Oct., 1920, *Marloth 9622* (M); among cliffs on Sneuwkraus, Farm Uitkyk, date lacking, *Marloth 9729* (M); in sandy places in Nieuwkloof near Tulbagh, Oct., 1886, *MacOwan 821*, in part (B, A, G); Barrydale, Oct., 1897, *Galpin 4356* (A, K); mountain ridges along lower part of Zonder Einde River, date lacking *Zeyher 5477* (K, B); Mossel Bay District, Klein Berg, 25 Sept., 1897, *Galpin 4355* (K).

There is every gradation possible between this and the species, which makes specific separation impossible. The most nearly consistent difference is the size of the corolla-sacs, and even this varies as may be seen in *MacOwan 821* and *1768*, *Marloth 12942*, *Andreae 428*, *Schlechter 8517* and *10944*, *Rust 226*, and *Grant 4869a*. In the last, corollas may be found in which the sac is broad and shallow or almost spurred. The nearly entire leaves of the plant on the type sheet are duplicated in many specimens, having the short sacs typical of the species. The ovary is papillose in some specimens and not in others in both the species and the variety.

3. **H. centrodes** Hiern in Th.-Dyer, Fl. Cap. 4^2: 167. 1904.
Hemimeris nana Diels in Engler's Bot. Jahrb. **44**: 121. 1909.

A glandular and viscid-pubescent annual, 10–30 cm. high, simple or more commonly branched from at or near the base, stems quadrangular, relatively stout; leaves opposite, ovate or elliptical, obtuse, coarsely and bluntly toothed, sometimes pinnatifid, rarely shallowly dentate, 2–4 cm. long, 0.5–1.0 cm. wide, base cuneate, petioles as long as or shorter than the blade, the uppermost leaves occasionally subsessile, internodes usually longer than the leaves, sometimes with smaller leaves fascicled in the axils; inflorescence racemose, often with several flowers having much shortened internodes clustered at the apex, and axillary flowers lower on the stem; pedicels rather stout, 1.5–4.0 cm. long, frequently deflexed in maturity, bracts linear or oblong, irregularly dentate with scattered teeth; calyx-lobes unequal, ciliate, ovate, oblong, or elliptical, obtuse, 4–6 mm. long, the uppermost lobe larger than the others and rounded

at the apex; corolla yellow, pubescent without, 0.8–1.5 cm. long, the upper lip 2.0–2.5 mm. long, erect, emarginate, with an incurved margin and 2 dark brown spots on either side of the center, lateral lobes rounded, about 2 mm. long and wide, densely maculate with sessile glands near the base and with ascending pockets projecting over the spur, middle lobe broadly rounded, 4–6 mm. long, 5–7 mm. broad, spurs 2, broadly obconical, nearly parallel for most of their length, incurved, blunt at the apex, 5–7 mm. long, 2–3 mm. broad at the base; stamens erect, shorter than the upper lip, filaments with broad membranaceous wings, anthers large, subglobose or oval, about 1.5 mm. long; ovary minutely puberulent, style narrowly winged, stout, curved toward the lower lip and shorter than the ovary; capsule subglobose, 5–7 mm. long, exserted; seeds numerous, black, minutely papillose, sometimes with very narrow white wings.

Distribution: in sandstone regions in the mountains around Calvinia and south into the Sutherland and Laingsburg Districts.

CAPE PROVINCE: in Karroo soil, Calvinia, Sept., year lacking, *Leipoldt 936* (K); stony ground near Elandsfontein Farm on road between Calvinia and Middlepost, 28 Sept., 1929, *Grant & Theiler 4891* (K); Hantam Mts. west of Calvinia, 14 Sept., 1900, *Diels 643* (B, type of *H. nana*); near Calvinia, 28 Sept., 1929, *Grant & Theiler 4889* (BH, K, P, MBG); Bokkeveld, 12–13 Sept., 1900, *Pritzel* (B); Onder Bokkeveld, in hills around Matjesfontein, 20 Aug., 1897, *Schlechter 10925* (K, TYPE, B, Gen, US, MBG).

This is the largest and showiest of the four species in the genus. At first sight, one might easily take it for a yellow-flowered *Diascia*, but the shape of the corolla and the number of stamens place it in *Hemimeris*. The brown spots on the corolla often are conspicuous.

4. **H. gracilis** Schlechter in Jour. Bot. **36**: 375. 1898; Hiern in Th.-Dyer, Fl. Cap. **4**[2]: 167. 1904.

Small slender, glandular-pubescent annuals, erect, simple or occasionally with weak branches from near the base, 6–20 cm. high, stems tetragonal, often conspicuously channelled, internodes usually longer than the leaves; leaves thin, ovate to oblong, broadly obtuse, dentate with a few shallow and blunt

teeth, or coarsely dentate with crenate teeth, sometimes practically entire, truncate, cuneate or cordate at base, 0.8–5.5 cm. long, 0.4–2.5 cm. wide, petioles slender, shorter or longer than the blade; flowers axillary in the uppermost leaves, often crowded toward the apex, the internodes being very much shortened; pedicels slender, frequently deflexed in fruit, 1.5–4.0 cm. long; calyx-lobes narrowly oblong to lanceolate, obtuse, unequal, 2–4 mm. long, the uppermost longer and broader than the others; corolla yellow, 4–6 mm. long, posterior lip short, concave, the upper part arched and more or less concealing the anthers, anterior lip longer, the lobes broadly rounded or truncate, the lateral lobes short, spurs 3–5 mm. long, widely divergent, conical, blunt, longer than the lower lip, throat short, gibbous; stamens erect, filaments winged, glabrous; style about as long as the ovary, 1–2 mm. long, glabrous, broadly winged, the wings wider than the style proper, stigma capitate, capsule subglobose, 3–4 mm. long, sparsely glandular-pubescent or glabrous; seeds numerous, papillate, oval, brown.

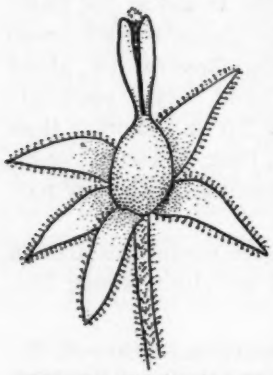

Fig. 3. *Hemimeris gracilis* Schlechter, calyx and pistil × 15.

Distribution: in sandy or rocky places from Van Rhynsdorp and Calvinia east to the Laingsburg District. Flowering from July until October or November.

CAPE PROVINCE: western slopes of Bokkeveld Mts., Oct., 1916, *Marloth 7662* (M); Oorlogskloof, Onder Bokkeveld, 21 Aug., 1897, *Schlechter 10971* (B, K, Gen, A, US, MBG); summit, Kubiskouw, on shaded krantzes under rocks, 8 Sept., 1926, *Marloth 12878* (M); in hills, Matjesfontein, Onder Bokkeveld, 19 Aug., 1897, *Schlechter 10918* (B, K, Gen, A, US); Hex River Valley, 14 Aug., 1896, *Wolley Dod 4010* (K); Hex River Valley, roadside 3 miles up from station, 14 Aug., 1897, *Wolley Dod* (B, TYPE).

DOUBTFUL SPECIES

Hemimeris bonae-spei L. Pl. Rar. Afr. 8. 1760.

Anagallis capensis L. Sp. Pl. ed. 1, 149. 1753, and ed. 10, 920. 1759.

SPECIES EXCLUDED

Hemimeris acutifolia Pers. Syn. Pl. **2**: 162. 1807. = **Alonsoa acutifolia** R. & P. Syst. Veg. 153. 1798.

Hemimeris caulialata Pers. Syn. Pl. **2**: 162. 1807. = **Alonsoa linearis** R. & P. Syst. Veg. 154. 1798.

Hemimeris coccinea Willd. Sp. Pl. **3**: 283. 1800. = **Alonsoa linearis** R. & P. Syst. Veg. 154. 1798.

Hemimeris diffusa L. f. Suppl. 280. 1781. = **Diascia diffusa** (L. f.) Benth. in Hook. Comp. Bot. Mag. **2**: 16. 1836, and **Diascia elongata** Benth. in Hook. l.c. 1836.

Hemimeris elegans Hiern in Jour. Bot. **39**: 102. 1901. = *Diascia* sp.

Hemimeris hirsuta Spreng. Syst. Veg. **2**: 809. 1825. = *Alonsoa* sp.

Hemimeris incisifolia Pers. Syn. Pl. **2**: 162. 1807. = **Alonsoa incisifolia** R. & P. Syst. Veg. 154. 1798.

Hemimeris intermedia Lodd. Bot. Cab. *t. 1456*. 1828. = **Alonsoa incisifolia** R. & P. Syst. Veg. 154. 1798.

Hemimeris linearifolia HBK. Nov. Gen. **2**: 377. 1817. = **Alonsoa linearifolia** Steud. Nom. ed. 2. **1**: 60. 1841.

Hemimeris macrophylla Thun. Nov. Gen. Pl. 76. 1784. = **Diascia macrophylla** (Thun.) Spreng. Syst. Veg. **2**: 800. 1825.

Hemimeris Mutisii HBK. Nov. Gen. **2**: 376. 1817. = **Alonsoa Mutisii** G. Don, Gen. Hist. **4**: 513. 1838.

Hemimeris parviflora HBK. Nov. Gen. **2**: 376. 1817. = **Alonsoa caulialata** R. & P. Syst. Veg. 152. 1798.

Hemimeris peduncularis Lam. Cycl. **3**: 105. 1789. = **Diascia diffusa** (L. f.) Benth. in Hook. Comp. Bot. Mag. **2**: 16. 1836.

Hemimeris procumbens Pers. Syn. Pl. **2**: 162. 1807. = **Alonsoa procumbens** R. & P. Syst. Veg. 154. 1798.

Hemimeris unilabiata (L. f.) Thun. Nov. Gen. Pl. 78. 1784. = **Diascia unilabiata** (L. f.) Benth. in DC. Prodr. **10**: 257. 1846.

Hemimeris urticifolia Willd. Sp. Pl. **3**: 282. 1800. = **Alonsoa incisifolia** R. & P. Syst. Veg. 154. 1798.